

Experiment Number: 20725 - 03
Test Type: CHRONIC
Route: RESPIRATORY EXPOSURE WHOLE BODY
Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
2,3-Butanedione
CAS Number: 431-03-8

Date Report Requested: 04/12/2016
Time Report Requested: 16:27:54
First Dose M/F: 08/17/09 / 08/17/09
Lab: BNW

F1_RE

NTP Study Number: C20725
Lock Date: 10/11/2012
Cage Range: ALL
Date Range: ALL
Reasons For Removal: ALL
Removal Date Range: ALL
Treatment Groups: Include ALL
Study Gender: Both
TDMSE Version: 3.0.2.3_002
PWG Approval Date: 01/15/2016

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WISTAR HAN RATS MALE Control	DAY ON TEST																									males (cont...)	
	0486	0633	0729	0729	0771	0773	0773	0837	0833	0833	0902	0909	0909	0909	0909	0909	0909	0909	0909	0909	0909	0909	0909	0909	0909		
ANIMAL ID	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	0000	
Acinus, Carcinosarcoma, Metastatic, Prostate																											X
Salivary Glands	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Stomach, Forestomach	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Stomach, Glandular	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
CARDIOVASCULAR SYSTEM																											
Blood Vessel	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Heart	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Lymphoma Malignant																											X
ENDOCRINE SYSTEM																											
Adrenal Cortex	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Adenoma																											
Adrenal Medulla	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Pheochromocytoma Benign																											
Islets, Pancreatic	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Parathyroid Gland	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Adenoma																											
Lymphoma Malignant																											X
Pituitary Gland	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Pars Distalis, Adenoma	X	X					X																				X

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Wistar Han Rats Male Control	DAY ON TEST																									males (cont...)
	0486	0633	0729	0729	0771	0773	0773	0773	0773	0773	0773	0773	0773	0773	0773	0773	0773	0773	0773	0773	0773	0773	0773	0773		
ANIMAL ID	0001	0002	0003	0004	0005	0006	0007	0008	0009	0010	0011	0012	0013	0014	0015	0016	0017	0018	0019	0020	0021	0022	0023	0024	0025	
Bone Marrow	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Lymph Node						+																				
Lymph Node, Bronchial Lymphoma Malignant	+	+	+	+	M	+	+	+	X	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	M	
Lymph Node, Mandibular Lymphoma Malignant	+	+	M	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	M	+	+	
Lymph Node, Mediastinal Lymphoma Malignant	M	+	+	+	+	+	+	+	X	+	+	+	+	+	M	M	+	+	+	+	+	+	+	M	+	
Lymph Node, Mesenteric Hemangiosarcoma Histiocytic Sarcoma	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Spleen Hemangiosarcoma Lymphoma Malignant	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Thymus Lymphoma Malignant Thymoma Benign	M	+	+	+	+	+	+	+	X	+	+	+	+	+	+	+	M	+	+	+	+	+	+	+	+	
INTEGUMENTARY SYSTEM																										
Mammary Gland Carcinoma	M	M	M	+	M	M	+	M	M	M	M	M	+	M	+	+	+	M	M	+	M	+	M	M	+	
Skin	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	

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WISTAR HAN RATS MALE Control	DAY ON TEST																									males (cont...)
	0 4 8 6	0 6 3 3	0 7 2 9	0 7 2 9	0 7 3 1	0 7 3 0	0 3 7 9	0 5 3 0	0 7 3 0	0 4 3 2	0 7 2 9	0 7 2 9	0 6 9 5	0 7 2 9	0 7 3 0	0 5 2 3	0 7 3 1	0 6 3 3	0 7 2 9	0 7 3 1	0 7 3 0	0 7 2 9	0 7 2 9	0 7 2 9		
ANIMAL ID	0 0 0 0 1	0 0 0 0 2	0 0 0 0 3	0 0 0 0 4	0 0 0 0 5	0 0 0 0 6	0 0 0 0 7	0 0 0 0 8	0 0 0 0 9	0 0 0 0 0	0 0 0 0 1	0 0 0 0 1	0 0 0 0 2	0 0 0 0 3	0 0 0 0 4	0 0 0 0 5	0 0 0 0 6	0 0 0 0 7	0 0 0 0 8	0 0 0 0 9	0 0 0 0 0	0 0 0 0 1	0 0 0 0 2	0 0 0 0 3	0 0 0 0 4	0 0 0 0 5

Epidermis, Keratoacanthoma
 Sebaceous Gland, Adenoma
 Subcutaneous Tissue, Fibrous Histiocytoma
 Subcutaneous Tissue, Myxoma

X

MUSCULOSKELETAL SYSTEM

Bone	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Skeletal Muscle	+																									

NERVOUS SYSTEM

Brain	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Glioma Malignant																										
Granular Cell Tumor Benign																										
Granular Cell Tumor Malignant																										
Peripheral Nerve	+																									
Spinal Cord	+																									

RESPIRATORY SYSTEM

Larynx	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Lymphoma Malignant																										
Lung	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Alveolar/Bronchiolar Adenoma																										
Carcinosarcoma, Metastatic, Prostate																										
Lymphoma Malignant																										

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	04	06	07	07	07	07	03	05	07	04	07	07	06	07	05	07	07	06	07	07	07	07	07	07		
Control	08	03	02	02	03	03	07	03	03	03	02	02	09	02	03	02	03	02	03	03	03	02	02	02	02	
	06	03	09	09	01	00	09	00	00	00	02	09	05	09	00	03	01	09	03	01	00	09	03	09	09	
	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	
	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	
	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	
	00	00	00	00	00	00	00	00	00	01	01	01	01	01	01	01	01	01	01	02	02	02	02	02	02	
	01	02	03	04	05	06	07	08	09	00	01	02	03	04	05	06	07	08	09	00	01	02	03	04	05	
Nose Adenoma	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Trachea Lymphoma Malignant	+	+	+	+	+	+	+	+	X	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
SPECIAL SENSES SYSTEM																										
Eye	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Harderian Gland	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
URINARY SYSTEM																										
Kidney Histiocytic Sarcoma	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Urinary Bladder Lymphoma Malignant	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
SYSTEMIC LESIONS																										
Multiple Organ Histiocytic Sarcoma	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
Lymphoma Malignant									X																	
Mesothelioma Malignant																										

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WISTAR HAN RATS MALE	DAY ON TEST																								* TOTALS
	0730	0733	0730	0732	0739	0742	0772	0777	0777	0777	0777	0777	0777	0777	0777	0777	0777	0777	0777	0777	0777	0777	0777	0777	
Control	0026	0027	0028	0029	0030	0031	0032	0033	0034	0035	0036	0037	0038	0039	0040	0041	0042	0043	0044	0045	0046	0047	0048	0049	50

ALIMENTARY SYSTEM

Esophagus	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	50
Lymphoma Malignant																									1
Intestine Large, Cecum	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	50
Intestine Large, Colon	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	50
Intestine Large, Rectum	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	50
Intestine Small, Duodenum	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	50
Intestine Small, Ileum	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	50
Intestine Small, Jejunum	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	50
Histiocytic Sarcoma																									1
Leiomyoma																									1
Liver	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	50
Hemangioma																									1
Lymphoma Malignant																									1
Mesentery		+																							5
Carcinosarcoma, Metastatic, Prostate																									1
Histiocytic Sarcoma																									1
Oral Mucosa																									1
Squamous Cell Carcinoma																									1
Pancreas	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	50

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WISTAR HAN RATS MALE Control	DAY ON TEST																								* TOTALS		
	0730	0730	0730	0732	0739	0772	0777	0777	0777	0777	0777	0777	0777	0777	0777	0777	0777	0777	0777	0777	0777	0777	0777	0777			
ANIMAL ID	00026	00007	00008	00009	00010	00011	00012	00013	00014	00015	00016	00017	00018	00019	00020	00021	00022	00023	00024	00025	00026	00027	00028	00029	00030		
Bone Marrow	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	50		
Lymph Node		+	+							+						+								+	6		
Lymph Node, Bronchial Lymphoma Malignant	M	+	+	+	M	+	M	+	+	+	+	M	+	+	M	+	+	+	+	+	+	+	M	M	41 1		
Lymph Node, Mandibular Lymphoma Malignant	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	48 1		
Lymph Node, Mediastinal Lymphoma Malignant	+	+	+	+	M	+	+	+	+	M	M	+	+	+	+	+	+	+	+	+	+	+	+	M	42 1		
Lymph Node, Mesenteric Hemangiosarcoma Histiocytic Sarcoma	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	50 2 1		
Spleen Hemangiosarcoma Lymphoma Malignant	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	50 1 1		
Thymus Lymphoma Malignant Thymoma Benign	+	+	+	+	+	+	+	M	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	47 2 1		
INTEGUMENTARY SYSTEM																											
Mammary Gland Carcinoma	M	M	+	M	+	M	M	M	M	+	M	M	M	M	M	M	M	M	M	M	M	M	M	M	12 1		
Skin	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	50		

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Wistar Han Rats Male Control	DAY ON TEST																								* TOTALS
	0730	0730	0730	0732	0734	0739	0742	0743	0744	0745	0746	0747	0748	0749	0750	0751	0752	0753	0754	0755	0756	0757	0758	0759	
ANIMAL ID	0026	0027	0028	0029	0030	0031	0032	0033	0034	0035	0036	0037	0038	0039	0040	0041	0042	0043	0044	0045	0046	0047	0048	0049	

Epidermis, Keratoacanthoma																									3
Sebaceous Gland, Adenoma																									1
Subcutaneous Tissue, Fibrous Histiocytoma																									1
Subcutaneous Tissue, Myxoma																									1

MUSCULOSKELETAL SYSTEM

Bone	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	50
Skeletal Muscle																								6

NERVOUS SYSTEM

Brain	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	50
Glioma Malignant																								1
Granular Cell Tumor Benign																								3
Granular Cell Tumor Malignant																								1
Peripheral Nerve																								6
Spinal Cord																								6

RESPIRATORY SYSTEM

Larynx	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	50
Lymphoma Malignant																								1
Lung	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	50
Alveolar/Bronchiolar Adenoma																								1
Carcinosarcoma, Metastatic, Prostate																								1
Lymphoma Malignant																								1

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WISTAR HAN RATS MALE 12.5 ppm	DAY ON TEST																									ANIMAL ID	males (cont...)
	0729	0600	0702	0702	0703	0706	0707	0707	0603	0605	0702	0703	0703	0603	0702	0703	0703	0603	0608	0702	0701	0601	0703	0703	0703		
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	7	6	7	7	7	6	7	7	6	7	7	7	7	6	7	7	7	6	6	7	6	7	7	7	7		
	2	0	2	2	3	0	0	3	5	2	3	3	3	3	2	3	3	3	8	2	1	1	3	3	3		
	9	0	9	9	0	6	1	0	6	9	0	0	0	3	9	0	0	3	2	9	1	1	0	0	0		
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2		
	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2		
	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5		

Squamous Cell Carcinoma

X

Pancreas

+ +

Salivary Glands
Carcinoma

+ +

Stomach, Forestomach
Squamous Cell Papilloma

+ +

Stomach, Glandular
Schwannoma Malignant, Metastatic, Heart

+ +

CARDIOVASCULAR SYSTEM

Blood Vessel

+ +

Heart
Schwannoma Malignant
Epicardium, Mesothelioma Malignant
Pericardium, Mesothelioma Malignant

+
 X
 X
 X

ENDOCRINE SYSTEM

Adrenal Cortex
Adenoma

+
 X

Adrenal Medulla
Pheochromocytoma Benign

+
 X

Islets, Pancreatic

+ +

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 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS MALE
12.5 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | | ANIMAL ID | males
(cont...) |
|----------------------------------|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|--------------------|
| | 0729 | 0600 | 0702 | 0722 | 0733 | 0600 | 0701 | 0703 | 0603 | 0705 | 0702 | 0703 | 0703 | 0603 | 0702 | 0703 | 0603 | 0702 | 0606 | 0707 | 0606 | 0702 | 0607 | 0706 | 0707 | | |
| | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |
| | 12 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Adenoma | X | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Parathyroid Gland
Bilateral, Adenoma | + | + | + | + | + | + | M | + | + | + | + | + | + | + | + | + | + | + | + | M | + | + | + | + | + | + | |
| Pituitary Gland
Pars Distalis, Adenoma
Pars Intermedia, Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Thyroid Gland
C-cell, Adenoma
C-cell, Carcinoma
Follicular Cell, Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |

GENERAL BODY SYSTEM

NONE

GENITAL SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Epididymis
Mesothelioma Malignant | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Preputial Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Prostate
Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Seminal Vesicle | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Testes | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS MALE
12.5 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | ANIMAL ID | males
(cont...) | | | |
|----------------------------------|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|--------------------|------|------|------|
| | 0729 | 0600 | 0729 | 0729 | 0776 | 0777 | 0777 | 0633 | 0652 | 0679 | 0700 | 0700 | 0700 | 0700 | 0633 | 0729 | 0729 | 0729 | 0666 | 0729 | | | 0677 | 0677 | 0777 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2 | 2 | 2 | 2 | 3 | 0 | 0 | 3 | 5 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 8 | 2 | 1 | 1 | 3 | 3 | 3 |
| | 9 | 0 | 9 | 9 | 0 | 6 | 1 | 0 | 6 | 9 | 0 | 0 | 0 | 0 | 3 | 9 | 0 | 0 | 3 | 2 | 9 | 1 | 1 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 |

Interstitial Cell, Adenoma

X

X X

HEMATOPOIETIC SYSTEM

Bone Marrow

+ +

Lymph Node

+ + +

Lymph Node, Bronchial

+ + + + + + + + + + + + M + + + + + + + + + + + +

Lymph Node, Mandibular

+ + + + + + + + M + + + + M + + + + + + + + + + + +

Lymph Node, Mediastinal

+ M + + +

Hemangiosarcoma

X

Mesothelioma Malignant

X

Lymph Node, Mesenteric

+ +

Schwannoma Malignant, Metastatic, Heart

Spleen

+ +

Histiocytic Sarcoma

X

Thymus

+ + + I + + + + + + + + + + + + + + + + + + + M +

INTEGUMENTARY SYSTEM

Mammary Gland

M M M M M M M M M M M M M M + M M M + M + M + M

Skin

+ +

Trichoepithelioma

Epidermis, Basal Cell Carcinoma

X

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| | | DAY ON TEST | | | | | | | | | | | | | | | | | | | | males
(cont...) | |
|----------------------|--|-------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--------------------|---|
| WISTAR HAN RATS MALE | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 |
| 12.5 ppm | | 7 | 6 | 7 | 7 | 7 | 6 | 7 | 7 | 6 | 7 | 7 | 7 | 6 | 7 | 7 | 7 | 6 | 6 | 7 | 6 | | 7 |
| ANIMAL ID | | 2 | 0 | 2 | 2 | 3 | 0 | 0 | 3 | 5 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 8 | 2 | 1 | 1 | |
| | | 9 | 0 | 9 | 9 | 0 | 6 | 1 | 0 | 6 | 9 | 0 | 0 | 3 | 9 | 0 | 0 | 3 | 2 | 9 | 1 | 1 | |
| | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | |
| | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | |

Epidermis, Keratoacanthoma X
 Epidermis, Squamous Cell Papilloma X
 Subcutaneous Tissue, Fibrous Histiocytoma

MUSCULOSKELETAL SYSTEM

Bone +
 Skeletal Muscle + + +
 Mesothelioma Malignant X
 Squamous Cell Carcinoma, Metastatic, Oral Mucosa X

NERVOUS SYSTEM

Brain +
 Glioma Malignant X
 Granular Cell Tumor Benign X
 Squamous Cell Carcinoma, Metastatic, Oral Mucosa X
 Peripheral Nerve +
 Spinal Cord +

RESPIRATORY SYSTEM

Larynx +
 Lung +
 Histiocytic Sarcoma X
 Mesothelioma Malignant X

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| Wistar Han Rats Male
12.5 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | males
(cont...) | | | | | | |
|----------------------------------|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|--------------------|------|------|------|------|------|------|
| | 0729 | 0600 | 0729 | 0722 | 0730 | 0606 | 0701 | 0700 | 0603 | 0705 | 0702 | 0703 | 0703 | 0603 | 0709 | 0700 | 0603 | 0608 | 0702 | 0701 | | 0606 | 0707 | 0607 | 0703 | 0703 | 0600 |
| ANIMAL ID | 0001 | 0002 | 0003 | 0004 | 0005 | 0006 | 0007 | 0008 | 0009 | 0010 | 0011 | 0012 | 0013 | 0014 | 0015 | 0016 | 0017 | 0018 | 0019 | 0020 | 0021 | 0022 | 0023 | 0024 | 0025 | 0026 | 0027 |

Mediastinum, Schwannoma Malignant, Metastatic, Heart

Nose +

Pleura +
 Mesothelioma Malignant X

Trachea +

SPECIAL SENSES SYSTEM

Eye + + + + + + + + + + + + + + + + + X + + + + + + +
 Schwannoma Malignant, Metastatic, Harderian Gland X
 Retina, Melanoma Malignant X

Harderian Gland +
 Schwannoma Malignant X

URINARY SYSTEM

Kidney +
 Liposarcoma

Ureter

Urinary Bladder +

SYSTEMIC LESIONS

Multiple Organ +

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS MALE
12.5 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | * TOTALS | |
|----------------------------------|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|----------|------|
| | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | | 0730 |
| ANIMAL ID | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 |
| | 67 | 89 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 |

ALIMENTARY SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|
| Esophagus | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Intestine Large, Cecum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Intestine Large, Colon | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Intestine Large, Rectum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Schwannoma Malignant, Metastatic, Heart | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Intestine Small, Duodenum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Schwannoma Malignant, Metastatic, Heart | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Intestine Small, Ileum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Carcinoid Tumor Benign | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Schwannoma Malignant, Metastatic, Heart | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Intestine Small, Jejunum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Liver | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Hepatocellular Adenoma | | | | X | | | | | | | | | | | | | | | | | | | 1 |
| Histiocytic Sarcoma | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Schwannoma Malignant, Metastatic, Heart | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Mesentery | | | | | | | | | | | | | | | | | | | | | | | 4 |
| Hemangiosarcoma | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Fat, Liposarcoma, Metastatic, Kidney | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Oral Mucosa | | | | | | | | | | | | | | | | | | | | | | | 1 |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

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 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS MALE
12.5 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | * TOTALS |
|--|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-------------------|----------|
| | 0730 | 0773 | 0773 | 0773 | 0773 | 0773 | 0773 | 0773 | 0773 | 0773 | 0773 | 0773 | 0773 | 0773 | 0773 | 0773 | 0773 | 0773 | 0773 | 0773 | 0773 | 0773 | 0773 | 0773 | |
| ANIMAL ID | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | 0022 | |
| Squamous Cell Carcinoma | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Pancreas | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Salivary Glands
Carcinoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
1 | |
| Stomach, Forestomach
Squamous Cell Papilloma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
1 | |
| Stomach, Glandular
Schwannoma Malignant, Metastatic, Heart | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
1 | |
| CARDIOVASCULAR SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | |
| Blood Vessel | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Heart
Schwannoma Malignant
Epicardium, Mesothelioma Malignant
Pericardium, Mesothelioma Malignant | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
2
1
1 | |
| ENDOCRINE SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | |
| Adrenal Cortex
Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
2 | |
| Adrenal Medulla
Pheochromocytoma Benign | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
3 | |
| Islets, Pancreatic | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
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Experiment Number: 20725 - 03
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 Species/Strain: RATS/Wistar Han

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12.5 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | * TOTALS | |
|----------------------------------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|----------|--|
| | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | | |
| ANIMAL ID | 002226 | 000000 | 000000 | 000000 | 000000 | 000000 | 000000 | 000000 | 000000 | 000000 | 000000 | 000000 | 000000 | 000000 | 000000 | 000000 | 000000 | 000000 | 000000 | 000000 | 000000 | 000000 | 000000 | 000000 | | |
| | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|-------------------|
| Adenoma | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Parathyroid Gland
Bilateral, Adenoma | + | + | + | + | + | + | M | + | + | + | + | + | + | + | + | + | + | + | + | M | + | + | + | + | + | 46
1 |
| Pituitary Gland
Pars Distalis, Adenoma
Pars Intermedia, Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
14
1 |
| Thyroid Gland
C-cell, Adenoma
C-cell, Carcinoma
Follicular Cell, Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
5
1
1 |

GENERAL BODY SYSTEM

NONE

GENITAL SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---------|
| Epididymis
Mesothelioma Malignant | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
1 |
| Preputial Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Prostate
Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
1 |
| Seminal Vesicle | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Testes | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

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 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

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| WISTAR HAN RATS MALE
12.5 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | * TOTALS | | |
|--|-------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|----------|----|----|
| | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | 0730 | | | |
| ANIMAL ID | 002226 | 002227 | 002228 | 002229 | 002230 | 002231 | 002232 | 002233 | 002234 | 002235 | 002236 | 002237 | 002238 | 002239 | 002240 | 002241 | 002242 | 002243 | 002244 | 002245 | 002246 | 002247 | 002248 | 002249 | 002250 | | |
| Mediastinum, Schwannoma Malignant, Metastatic, Heart | | | | | | | | | | | | | | | | | | | | | | | | | X | 1 | |
| Nose | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Pleura | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Mesothelioma Malignant | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Trachea | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| SPECIAL SENSES SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Eye | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Schwannoma Malignant, Metastatic, Harderian Gland | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Retina, Melanoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Harderian Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Schwannoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| URINARY SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kidney | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Liposarcoma | | | | | | | | | | | | | | | | | | | | | | | | | | X | 1 |
| Ureter | | | | | | | | | | | | | | | | | | | | | | | | | | + | 1 |
| Urinary Bladder | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| SYSTEMIC LESIONS | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Multiple Organ | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| | | DAY ON TEST | | | | | | | | | | | | | | | | | | | | males
(cont...) | | | | | |
|-----------------------------|---------------|-------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--------------------|---|---|---|---|---|
| WISTAR HAN RATS MALE | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | | | |
| | 25 ppm | 7 | 7 | 7 | 7 | 7 | 7 | 5 | 7 | 3 | 7 | 5 | 7 | 5 | 5 | 7 | 7 | 7 | 7 | 7 | 6 | | 7 | 7 | 5 | 6 | |
| | ANIMAL ID | 3 | 3 | 2 | 3 | 3 | 3 | 8 | 3 | 2 | 2 | 2 | 4 | 9 | 3 | 3 | 3 | 3 | 2 | 9 | 4 | 9 | 3 | 2 | 9 | 1 | 7 |
| | | 1 | 1 | 9 | 0 | 0 | 0 | 2 | 0 | 5 | 9 | 7 | 9 | 3 | 2 | 0 | 0 | 1 | 0 | 9 | 4 | 9 | 1 | 2 | 2 | 7 | |
| | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 5 |

ALIMENTARY SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Esophagus | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | |
| Intestine Large, Cecum
Lymphoma Malignant | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | X | |
| Intestine Large, Colon
Lymphoma Malignant | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | X | |
| Intestine Large, Rectum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Intestine Small, Duodenum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Intestine Small, Ileum
Lymphoma Malignant | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | X | |
| Intestine Small, Jejunum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Liver
Lymphoma Malignant | + | + | + | + | + | + | + | + | X | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | X | |
| Mesentery
Lymphoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | | | | + | X |
| Pancreas
Lymphoma Malignant | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | X |
| Salivary Glands | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Stomach, Forestomach | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS MALE | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | | males
(cont...) | |
|----------------------|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|--------------------|--|
| | 0731 | 0731 | 0732 | 0733 | 0733 | 0733 | 0738 | 0733 | 0732 | 0732 | 0732 | 0734 | 0739 | 0733 | 0733 | 0733 | 0733 | 0737 | 0739 | 0736 | 0732 | 0731 | 0732 | 0735 | 0736 | | |
| 25 ppm | 0040 | 0040 | 0040 | 0040 | 0040 | 0040 | 0044 | 0044 | 0044 | 0044 | 0044 | 0044 | 0044 | 0044 | 0044 | 0044 | 0044 | 0044 | 0044 | 0044 | 0044 | 0044 | 0044 | 0044 | 0044 | | |
| | 0001 | 0002 | 0003 | 0004 | 0005 | 0006 | 0007 | 0008 | 0009 | 0000 | 0001 | 0002 | 0003 | 0004 | 0005 | 0006 | 0007 | 0008 | 0009 | 0000 | 0001 | 0002 | 0002 | 0002 | 0002 | 0002 | |

Subcutaneous Tissue, Hemangioma

X

MUSCULOSKELETAL SYSTEM

Bone +

Skeletal Muscle
Hemangiosarcoma

NERVOUS SYSTEM

Brain +
 Glioma Malignant
 Granular Cell Tumor Benign X X

Peripheral Nerve

Spinal Cord

RESPIRATORY SYSTEM

Larynx +

Lung +
 Lymphoma Malignant X
 Neural Crest Tumor, Metastatic, Ear
 Mediastinum, Mesothelioma Malignant

Nose +

Trachea +

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| | | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | * TOTALS |
|-----------------------------|---------------|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| | | 0729 | 0731 | 0730 | 0729 | 0779 | 0779 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | |
| WISTAR HAN RATS MALE | 25 ppm | 0729 | 0731 | 0730 | 0729 | 0779 | 0779 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | |
| | | 0729 | 0731 | 0730 | 0729 | 0779 | 0779 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 |
| | | 00426 | 00407 | 00408 | 00409 | 00400 | 00400 | 00400 | 00400 | 00400 | 00400 | 00400 | 00400 | 00400 | 00400 | 00400 | 00400 | 00400 | 00400 | 00400 | 00400 | 00400 | 00400 | 00400 | 00400 | |
| | | 67 | 71 | 80 | 90 | 01 | 12 | 23 | 34 | 45 | 56 | 67 | 78 | 89 | 00 | 01 | 12 | 23 | 34 | 45 | 56 | 67 | 78 | 89 | 00 | |

ALIMENTARY SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--------|---------|
| Esophagus | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Intestine Large, Cecum
Lymphoma Malignant | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
1 |
| Intestine Large, Colon
Lymphoma Malignant | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
1 |
| Intestine Large, Rectum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Intestine Small, Duodenum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Intestine Small, Ileum
Lymphoma Malignant | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
1 |
| Intestine Small, Jejunum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Liver
Lymphoma Malignant | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
2 |
| Mesentery
Lymphoma Malignant | | + | | | | | + | | | | | | | | | | | | | | | | | 3
1 | |
| Pancreas
Lymphoma Malignant | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
1 |
| Salivary Glands | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Stomach, Forestomach | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS MALE
25 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | * TOTALS |
|-------------------------------------|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| | 0729 | 0731 | 0730 | 0729 | 0779 | 0777 | 0777 | 0777 | 0777 | 0777 | 0766 | 0777 | 0700 | 0777 | 0777 | 0777 | 0777 | 0755 | 0772 | 0777 | 0777 | 0755 | 0777 | 0755 | |
| ANIMAL ID | 00426 | 00442 | 00442 | 00442 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00445 | |
| Lymphoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Sarcoma | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Squamous Cell Carcinoma | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Squamous Cell Papilloma | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Stomach, Glandular | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Lymphoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| CARDIOVASCULAR SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | |
| Blood Vessel | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Heart | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Neural Crest Tumor, Metastatic, Ear | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Schwannoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| ENDOCRINE SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | |
| Adrenal Cortex | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Adenoma | | X | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Lymphoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Adrenal Medulla | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Pheochromocytoma Benign | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Islets, Pancreatic | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Parathyroid Gland | M | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 49 | |
| Pituitary Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Pars Distalis, Adenoma | | | | | | | | | | | | | | | | | | | | | | | | 9 | |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS MALE
25 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | * TOTALS |
|--------------------------------|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| | 079 | 0731 | 0730 | 0729 | 0729 | 0730 | 0731 | 0733 | 0733 | 0730 | 0735 | 0731 | 0733 | 0733 | 0733 | 0733 | 0733 | 0733 | 0733 | 0733 | 0733 | 0733 | 0733 | 0733 | |
| ANIMAL ID | 00426 | 00442 | 00442 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 | 00444 |

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|
| Thyroid Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| C-cell, Adenoma | | | | | | | X | | X | | | | | | | | | | | | | | | | 3 |
| C-cell, Adenoma, Multiple | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| C-cell, Carcinoma | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Follicular Cell, Adenoma | | | | | | | | | | | | | | X | | | | | | | | | X | | 2 |

GENERAL BODY SYSTEM

NONE

GENITAL SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|
| Epididymis | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Preputial Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Prostate | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Lymphoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Seminal Vesicle | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Lymphoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Testes | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |

HEMATOPOIETIC SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|
| Bone Marrow | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Lymphoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Lymph Node | | + | + | | | + | | | | | | | + | | | | | | | + | | | + | | 9 |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
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| WISTAR HAN RATS MALE
25 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | | * TOTALS | |
|---|-------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|----------|--|
| | 0729 | 0731 | 0730 | 0729 | 0779 | 0777 | 0777 | 0777 | 0777 | 0777 | 0766 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | | | |
| ANIMAL ID | 004266 | 004442 | 004444 | 004444 | 004444 | 004444 | 004444 | 004444 | 004444 | 004444 | 004444 | 004444 | 004444 | 004444 | 004444 | 004444 | 004444 | 004444 | 004444 | 004444 | 004444 | 004444 | 004444 | 004444 | | | |
| Lymph Node, Bronchial | + | + | + | + | + | + | M | + | + | + | + | + | + | M | + | + | M | + | + | + | + | + | M | + | + | 43 | |
| Lymph Node, Mandibular
Lymphoma Malignant | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | M | + | + | + | + | + | + | 49
2 | |
| Lymph Node, Mediastinal
Lymphoma Malignant | + | + | + | + | + | + | + | + | + | M | + | + | + | + | + | + | + | + | M | + | + | + | + | + | + | 47
2 | |
| Schwannoma Malignant, Metastatic, Thymus | | | | | | | | | | | | | | | | | | | | | | | | X | 1 | | |
| Lymph Node, Mesenteric
Hemangioma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
1 | | |
| Hemangiosarcoma | | | | | | | | | | | | | | | | | | | | | | | X | | 1 | | |
| Lymphoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | | 2 | | |
| Spleen
Lymphoma Malignant | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
2 | | |
| Thymus
Lymphoma Malignant | + | + | + | + | + | + | + | + | + | M | + | + | + | M | + | + | + | + | + | + | + | + | + | X | 48
2 | | |
| Schwannoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | X | 1 | | |
| Thymoma Benign | | | | | | | X | | | | | | | | | | | | | | | | | | 1 | | |
| INTEGUMENTARY SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mammary Gland | + | M | M | M | M | M | M | + | + | M | + | M | + | M | M | M | M | + | M | M | M | M | M | M | + | 14 | |
| Skin | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Epidermis, Keratoacanthoma | | | | | | | | | | | | | | | | | X | | | | | | | | 1 | | |
| Epidermis, Pilomatrixoma | | | | | | | | | | | | | | | | | | | | | | | X | | 1 | | |
| Epidermis, Squamous Cell Carcinoma | | | | | | | | | | | | | | | | | | | | | | | | | 1 | | |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS MALE
50 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | | ANIMAL ID | males
(cont...) |
|--------------------------------|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|--------------------|
| | 0731 | 0738 | 0742 | 0746 | 0771 | 0777 | 0777 | 0777 | 0766 | 0777 | 0766 | 0755 | 0777 | 0777 | 0755 | 0744 | 0777 | 0766 | 0777 | 0777 | 0755 | 0777 | 0755 | 0777 | 0755 | | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Blood Vessel | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Heart | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |

ENDOCRINE SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Adrenal Cortex
Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Adrenal Medulla
Pheochromocytoma Benign | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Islets, Pancreatic | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Parathyroid Gland | + | + | + | + | + | + | + | + | + | + | + | + | M | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Pituitary Gland
Pars Distalis, Adenoma
Pars Intermedia, Adenoma
Pars Nervosa, Schwannoma Malignant | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Thyroid Gland
C-cell, Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |

GENERAL BODY SYSTEM

NONE

GENITAL SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Epididymis | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
|------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue
 M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS MALE
50 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | | ANIMAL ID | males
(cont...) |
|--------------------------------|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|--------------------|
| | 0731 | 0738 | 0742 | 0764 | 0777 | 0777 | 0777 | 0766 | 0777 | 0766 | 0755 | 0777 | 0777 | 0755 | 0744 | 0777 | 0777 | 0766 | 0777 | 0755 | 0777 | 0755 | 0777 | 0755 | 0731 | | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0060 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0066 | |
| | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | |

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS MALE
50 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | ANIMAL ID | males
(cont...) | | |
|---|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|--------------------|------|------|
| | 0731 | 0738 | 0742 | 0746 | 0771 | 0777 | 0777 | 0777 | 0766 | 0777 | 0766 | 0755 | 0777 | 0777 | 0755 | 0744 | 0777 | 0777 | 0766 | 0777 | | | 0755 | 0777 |
| Thymus | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| INTEGUMENTARY SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | |
| Mammary Gland | + | + | + | M | M | M | + | M | M | + | M | + | M | M | M | M | + | M | M | + | M | M | + | + |
| Skin | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Epidermis, Squamous Cell Carcinoma | | | | | | | | | | | | | | | | | | | | | | | | X |
| Subcutaneous Tissue, Fibrosarcoma | | | | | | | | | | | | | | | | | | | | | | | | X |
| Subcutaneous Tissue, Schwannoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | X |
| MUSCULOSKELETAL SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | |
| Bone | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Skeletal Muscle | | | | | | | | | | | | | | | | | | | | | | | | + |
| NERVOUS SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | |
| Brain | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Granular Cell Tumor Benign | | | | | | | | | | | | | | | | | | | | | | | | X |
| Peripheral Nerve | | | | | | | | | | | | | | | | | | | | | | | | + |
| Spinal Cord | | | | | | | | | | | | | | | | | | | | | | | | + |
| RESPIRATORY SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | |
| Larynx | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Lung | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS MALE
50 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | | ANIMAL ID | males
(cont...) | | |
|--------------------------------|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|--------------------|------|------|
| | 0731 | 0738 | 0742 | 0746 | 0771 | 0777 | 0779 | 0786 | 0776 | 0765 | 0777 | 0777 | 0755 | 0777 | 0777 | 0755 | 0744 | 0777 | 0776 | 0772 | 0773 | 0771 | 0766 | 0773 | 0759 | | | 0775 | 0757 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

Alveolar/Bronchiolar Adenoma

X

Nose

+ +

Squamous Cell Carcinoma

Squamous Cell Papilloma

X

Trachea

+ +

SPECIAL SENSES SYSTEM

Eye

+ | +

Harderian Gland

+ +

Lacrimal Gland

+

URINARY SYSTEM

Kidney

+ +

Urinary Bladder

+ +

SYSTEMIC LESIONS

Multiple Organ

Lymphoma Malignant

Mesothelioma Malignant

+ +

X

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| Wistar Han Rats Male
50 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | * TOTALS |
|--------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|----------|
| | 0712261000626 | 0712261000626 | 0712261000626 | 0712261000626 | 0712261000626 | 0712261000626 | 0712261000626 | 0712261000626 | 0712261000626 | 0712261000626 | 0712261000626 | 0712261000626 | 0712261000626 | 0712261000626 | 0712261000626 | 0712261000626 | 0712261000626 | 0712261000626 | 0712261000626 | 0712261000626 | 0712261000626 | 0712261000626 | 0712261000626 | 0712261000626 | |
| ANIMAL ID | 00626 | 00626 | 00626 | 00626 | 00626 | 00626 | 00626 | 00626 | 00626 | 00626 | 00626 | 00626 | 00626 | 00626 | 00626 | 00626 | 00626 | 00626 | 00626 | 00626 | 00626 | 00626 | 00626 | 00626 | 00626 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|
| Blood Vessel | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Heart | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |

ENDOCRINE SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|-------------------|
| Adrenal Cortex
Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
1 |
| Adrenal Medulla
Pheochromocytoma Benign | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
3 |
| Islets, Pancreatic | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Parathyroid Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | M | + | M | + | + | + | + | + | + | + | + | 47 |
| Pituitary Gland
Pars Distalis, Adenoma
Pars Intermedia, Adenoma
Pars Nervosa, Schwannoma Malignant | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
5
1
1 |
| Thyroid Gland
C-cell, Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
1 |

GENERAL BODY SYSTEM

NONE

GENITAL SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|
| Epididymis | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
|------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS MALE
50 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | * TOTALS | | | | | | | |
|---|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|-------|-------|-------|-------|-------|---------|---------|
| | 071226 | 0661 | 0673 | 0675 | 0677 | 0678 | 0684 | 0685 | 0694 | 0695 | 0697 | 0697 | 0697 | 0696 | 0697 | 0697 | 0696 | 0696 | 0697 | 0696 | | 0697 | 0697 | 0695 | 0696 | 0697 | 0697 | 0695 |
| ANIMAL ID | 00626 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | |
| Mesothelioma Malignant | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Preputial Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Prostate | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Seminal Vesicle | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Testes | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Mesothelioma Malignant | | | | X | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Interstitial Cell, Adenoma | | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| HEMATOPOIETIC SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bone Marrow | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Lymph Node | + | | + | | | + | | | | | | | | | + | | | | | | + | | | | | | 7 | |
| Lymph Node, Bronchial | + | + | + | + | M | + | + | + | + | + | + | + | + | + | M | + | M | + | M | + | + | M | + | + | + | + | 42 | |
| Lymph Node, Mandibular
Squamous Cell Carcinoma, Metastatic, Skin | + | + | M | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 48
1 | |
| Lymph Node, Mediastinal
Lymphoma Malignant | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | M | M | + | + | 47
1 |
| Lymph Node, Mesenteric
Hemangioma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
1 | |
| Spleen | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS MALE
50 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | * TOTALS | | | | | | |
|---|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|-------|-------|-------|-------|-------|-------|
| | 07122 | 06611 | 06731 | 05724 | 06784 | 06595 | 05549 | 07535 | 07723 | 07737 | 06722 | 07739 | 06725 | 06669 | 07730 | 05670 | 06733 | 06631 | 06749 | 07729 | | 06771 | 05732 | 06633 | 06723 | 07731 | 05762 |
| ANIMAL ID | 00626 | 00662 | 00662 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | 00666 | |
| Thymus | + | M | + | + | + | + | + | + | + | + | + | + | + | + | + | M | + | + | + | + | + | + | + | + | + | 48 | |
| INTEGUMENTARY SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mammary Gland | M | + | + | M | + | M | + | + | M | M | M | M | M | M | + | + | + | + | + | M | M | + | M | M | + | 22 | |
| Skin | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Epidermis, Squamous Cell Carcinoma | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Subcutaneous Tissue, Fibrosarcoma | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Subcutaneous Tissue, Schwannoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| MUSCULOSKELETAL SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bone | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Skeletal Muscle | | | | | + | + | | | | | | | | | + | | | | | + | + | | | | | 6 | |
| NERVOUS SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Brain | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Granular Cell Tumor Benign | | | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Peripheral Nerve | | | | | + | + | | | | | | | | | + | | | | | + | + | | | | | 6 | |
| Spinal Cord | | | | | + | + | | | | | | | | | + | | | | | + | + | | | | | 6 | |
| RESPIRATORY SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Larynx | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Lung | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS MALE
50 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | * TOTALS |
|--------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|----------|
| | 071226 | 066757 | 066757 | 066757 | 066757 | 066757 | 066757 | 066757 | 066757 | 066757 | 066757 | 066757 | 066757 | 066757 | 066757 | 066757 | 066757 | 066757 | 066757 | 066757 | 066757 | 066757 | 066757 | 066757 | |
| ANIMAL ID | 000000000000000000000000 | 000000000000000000000000 | 000000000000000000000000 | 000000000000000000000000 | 000000000000000000000000 | 000000000000000000000000 | 000000000000000000000000 | 000000000000000000000000 | 000000000000000000000000 | 000000000000000000000000 | 000000000000000000000000 | 000000000000000000000000 | 000000000000000000000000 | 000000000000000000000000 | 000000000000000000000000 | 000000000000000000000000 | 000000000000000000000000 | 000000000000000000000000 | 000000000000000000000000 | 000000000000000000000000 | 000000000000000000000000 | 000000000000000000000000 | 000000000000000000000000 | 000000000000000000000000 | |
| Alveolar/Bronchiolar Adenoma | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Nose | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Squamous Cell Carcinoma | | | | | | | | | | | | | X | | | X | | | | | | | X | | 3 |
| Squamous Cell Papilloma | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Trachea | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| SPECIAL SENSES SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | |
| Eye | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 49 |
| Harderian Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Lacrimal Gland | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| URINARY SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kidney | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Urinary Bladder | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| SYSTEMIC LESIONS | | | | | | | | | | | | | | | | | | | | | | | | | |
| Multiple Organ | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Lymphoma Malignant | | X | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Mesothelioma Malignant | | | | X | | | | | | | | | | | | | | | | | | | | | 2 |

*** END OF MALE DATA ***

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS FEMALE
Control | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | | ANIMAL ID | females
(cont...) |
|---|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|---|-----------------------|----------------------|
| | 0
7
3
2 | 0
7
3
3 | 0
7
3
1 | 0
6
1
4 | 0
7
3
3 | 0
7
3
1 | 0
7
0
2 | 0
6
3
5 | 0
7
3
2 | 0
5
4
7 | 0
7
1
0 | 0
6
8
3 | 0
7
3
3 | 0
7
3
2 | 0
7
3
3 | 0
5
7
9 | 0
7
3
3 | 0
7
3
2 | 0
7
3
1 | 0
7
3
1 | 0
7
3
1 | 0
7
3
3 | 0
7
3
4 | 0
7
3
5 | | | |
| Blood Vessel | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 0
0
1
0
1 | females
(cont...) |
| Heart | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 0
0
1
0
1 | |
| ENDOCRINE SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Adrenal Cortex
Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 0
0
1
0
1 | |
| Adrenal Medulla
Pheochromocytoma Benign | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 0
0
1
0
1 | |
| Islets, Pancreatic | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 0
0
1
0
1 | |
| Parathyroid Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | M | + | M | + | + | + | + | + | + | + | 0
0
1
0
1 | |
| Pituitary Gland
Pars Distalis, Adenoma
Pars Intermedia, Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 0
0
1
0
1 | |
| Thyroid Gland
C-cell, Adenoma
C-cell, Carcinoma
Follicular Cell, Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 0
0
1
0
1 | |

GENERAL BODY SYSTEM

NONE

GENITAL SYSTEM

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| Wistar Han Rats Female
Control | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | | females
(cont...) |
|--|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|--|----------------------|
| | 0732 | 0733 | 0731 | 0674 | 0773 | 0773 | 0773 | 0675 | 0772 | 0757 | 0776 | 0773 | 0777 | 0777 | 0777 | 0579 | 0773 | 0773 | 0773 | 0773 | 0773 | 0773 | 0773 | 0773 | | |
| ANIMAL ID | 0010 | 0001 | 0001 | 0001 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | | |
| Clitoral Gland | + | + | + | + | + | + | + | M | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | |
| Ovary | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | |
| Granulosa-Theca Tumor Malignant | | X | | | | | | | | | | | | | | | | | | | | | | | | |
| Germinal Epithelium, Tubulostromal Adenoma | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Uterus | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | |
| Adenocarcinoma | | | | | | | | | X | | | | | | | | | | | | | | | | | |
| Polyp Stromal | | | | | | X | | X | | X | | | | | | | | X | X | | X | | | | | |
| Schwannoma Malignant | | | | | | | | X | | | | | | | | | | | | | | | | | | |
| Cervix, Sarcoma Stromal | | | | | | | | | | | | | | | | | X | | | | | | | | | |
| HEMATOPOIETIC SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bone Marrow | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | |
| Lymph Node | | + | | | | | | | | | | | | | | | | | | | | | | | | |
| Lymph Node, Bronchial | + | + | + | + | + | + | + | + | + | M | M | + | + | + | + | + | + | + | + | + | + | + | + | + | | |
| Lymph Node, Mandibular Hemangioma | M | + | + | + | + | + | + | + | + | + | + | M | + | + | + | + | + | + | + | + | + | + | + | + | | |
| Lymph Node, Mediastinal | + | + | + | + | + | + | M | + | + | + | M | + | + | + | + | + | + | M | + | + | + | + | + | M | | |
| Lymph Node, Mesenteric Hemangiosarcoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | |
| Spleen | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | |
| Thymus | + | + | + | + | + | + | M | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| Wistar Han Rats Female
Control | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | | * TOTALS |
|-----------------------------------|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| | 0732 | 0647 | 0413 | 0733 | 0733 | 0733 | 0614 | 0723 | 0253 | 0647 | 0573 | 0773 | 0773 | 0773 | 0667 | 0773 | 0773 | 0773 | 0773 | 0593 | 0739 | 0678 | 0763 | 0772 | | |
| ANIMAL ID | 00126 | 00117 | 00122 | 00111 | 00111 | 00111 | 00111 | 00111 | 00111 | 00111 | 00111 | 00111 | 00111 | 00111 | 00111 | 00111 | 00111 | 00111 | 00111 | 00111 | 00111 | 00111 | 00111 | 00111 | 00111 | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|
| Blood Vessel | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Heart | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |

ENDOCRINE SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|-------------------|
| Adrenal Cortex
Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
1 |
| Adrenal Medulla
Pheochromocytoma Benign | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
3 |
| Islets, Pancreatic | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Parathyroid Gland | + | + | + | + | + | M | + | + | + | + | + | + | + | + | + | + | + | + | M | + | + | + | + | + | 46 |
| Pituitary Gland
Pars Distalis, Adenoma
Pars Intermedia, Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
26
1 |
| Thyroid Gland
C-cell, Adenoma
C-cell, Carcinoma
Follicular Cell, Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
2
1
2 |

GENERAL BODY SYSTEM

NONE

GENITAL SYSTEM

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS FEMALE
Control | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | * TOTALS |
|--|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| | 0732 | 0647 | 0417 | 0732 | 0733 | 0733 | 0674 | 0722 | 0263 | 0547 | 0733 | 0733 | 0733 | 0677 | 0733 | 0733 | 0733 | 0733 | 0579 | 0733 | 0683 | 0732 | 0767 | | |
| ANIMAL ID | 00126 | 00017 | 00018 | 00019 | 00020 | 00021 | 00022 | 00023 | 00024 | 00025 | 00026 | 00027 | 00028 | 00029 | 00030 | 00031 | 00032 | 00033 | 00034 | 00035 | 00036 | 00037 | 00038 | 00039 | |
| Clitoral Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 49 | |
| Ovary | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Granulosa-Theca Tumor Malignant | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Germinal Epithelium, Tubulostromal Adenoma | X | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Uterus | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Adenocarcinoma | | | | | | | | | X | | | | | | | | | | | | | | | 2 | |
| Polyp Stromal | | | | | | | | X | | | | | | X | | | | X | | | | | | 9 | |
| Schwannoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Cervix, Sarcoma Stromal | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| HEMATOPOIETIC SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bone Marrow | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Lymph Node | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Lymph Node, Bronchial | + | + | + | + | + | M | + | + | + | M | + | M | + | M | + | + | + | + | + | + | + | M | + | 43 | |
| Lymph Node, Mandibular Hemangioma | + | + | M | + | + | + | + | + | + | M | + | + | + | + | + | + | + | + | + | + | + | + | + | 46 | |
| Lymph Node, Mediastinal | M | + | + | + | + | + | + | + | + | + | + | + | + | + | + | M | + | + | + | + | + | + | + | 44 | |
| Lymph Node, Mesenteric Hemangiosarcoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Spleen | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Thymus | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 49 | |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| | | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | | * TOTALS |
|------------------------------|--|-------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|--|--|----------|
| WISTAR HAN RATS FEMALE | | 07 | 06 | 04 | 07 | 07 | 07 | 06 | 07 | 02 | 06 | 05 | 07 | 07 | 07 | 06 | 07 | 07 | 07 | 07 | 05 | 07 | 06 | 07 | | | |
| Control | | 03 | 04 | 01 | 03 | 03 | 03 | 01 | 03 | 05 | 04 | 06 | 03 | 03 | 03 | 06 | 03 | 03 | 03 | 03 | 09 | 03 | 08 | 03 | | | |
| ANIMAL ID | | 02 | 07 | 07 | 02 | 01 | 03 | 04 | 02 | 03 | 07 | 01 | 03 | 02 | 01 | 07 | 02 | 03 | 02 | 01 | 03 | 09 | 01 | 07 | | | |
| | | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | | | |
| | | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | | | |
| | | 02 | 02 | 02 | 02 | 03 | 03 | 03 | 03 | 03 | 03 | 03 | 03 | 03 | 03 | 04 | 04 | 04 | 04 | 04 | 04 | 04 | 04 | 05 | | | |
| | | 06 | 07 | 08 | 09 | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 09 | | | |
| Larynx | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | | | |
| Lung | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | | | |
| Nose | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | | | |
| Trachea | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | | | |
| SPECIAL SENSES SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Eye | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | | | |
| Harderian Gland | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | | | |
| URINARY SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kidney | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | | | |
| Urinary Bladder | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | | | |
| SYSTEMIC LESIONS | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Multiple Organ | | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | | | |
| Lymphoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | 1 | | | |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
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Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

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 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS FEMALE | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | females
(cont...) |
|------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | 0
7
3
3 | 0
6
6
1 | 0
7
3
3 | 0
5
1
9 | 0
6
5
4 | 0
7
3
2 | 0
7
3
3 | 0
6
3
0 | 0
7
3
2 | 0
7
3
3 | 0
7
3
1 | 0
7
3
3 | 0
6
3
0 | 0
6
1
3 | 0
7
3
2 | 0
7
3
2 | 0
7
3
2 | 0
7
3
3 | 0
7
3
3 | 0
7
3
2 | 0
7
3
2 | 0
7
3
1 | 0
7
3
5 | 0
4
1
8 | |
| 12.5 ppm | 0
0
3
0
1 | 0
0
3
0
2 | 0
0
3
0
3 | 0
0
3
0
4 | 0
0
3
0
5 | 0
0
3
0
6 | 0
0
3
0
7 | 0
0
3
0
8 | 0
0
3
0
9 | 0
0
3
1
0 | 0
0
3
1
1 | 0
0
3
1
1 | 0
0
3
1
1 | 0
0
3
1
1 | 0
0
3
1
1 | 0
0
3
1
1 | 0
0
3
1
1 | 0
0
3
1
1 | 0
0
3
1
1 | 0
0
3
2
2 | 0
0
3
2
2 | 0
0
3
2
2 | 0
0
3
2
3 | 0
0
3
2
4 | 0
0
3
2
5 |

Subcutaneous Tissue, Adenocarcinoma,
 Metastatic, Uterus
 Subcutaneous Tissue, Lipoma

MUSCULOSKELETAL SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bone | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Skeletal Muscle
Adenocarcinoma, Metastatic, Uterus | | + | | + | | | | | | | | | | + | | | | | | | | | | + |

NERVOUS SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Brain
Granular Cell Tumor Benign
Schwannoma Malignant, Metastatic, Harderian
Gland | + | + | + | + | + | + | + | + | + | X | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Peripheral Nerve
Trigeminal, Schwannoma Malignant,
Metastatic, Harderian Gland | | + | | M | | | | | | | | | | + | | | | | | | | | | + |
| Spinal Cord | | + | | + | | | | | | | | | | | + | | | | | | | | | + |

RESPIRATORY SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Larynx | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Lung
Adenocarcinoma, Metastatic, Uterus
Leukemia Mononuclear | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
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Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
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 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS FEMALE
12.5 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | * TOTALS | | | | |
|------------------------------------|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|-------|-------|-------|-------|
| | 05771 | 07712 | 07713 | 07714 | 07715 | 07716 | 07717 | 07718 | 07719 | 07720 | 07721 | 07722 | 07723 | 07724 | 07725 | 07726 | 07727 | 07728 | 07729 | 07730 | | | | | |
| ANIMAL ID | 00326 | 00327 | 00328 | 00329 | 00330 | 00331 | 00332 | 00333 | 00334 | 00335 | 00336 | 00337 | 00338 | 00339 | 00340 | 00341 | 00342 | 00343 | 00344 | 00345 | 00346 | 00347 | 00348 | 00349 | 00350 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

ALIMENTARY SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|
| Esophagus | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Intestine Large, Cecum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Intestine Large, Colon | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Intestine Large, Rectum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Intestine Small, Duodenum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Intestine Small, Ileum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Adenocarcinoma, Metastatic, Uterus | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Intestine Small, Jejunum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Leiomyosarcoma | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Liver | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Adenocarcinoma, Metastatic, Uterus | | | X | | | | | | | | | | | | | | | | | | | | | | 2 |
| Cholangioma | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Hepatocellular Adenoma | | | | | | | | | | | | | | | | | | | | | | | X | | 1 |
| Leukemia Mononuclear | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Mesentery | | | | + | | | + | | | | + | | + | | | | | + | | | | | + | | 10 |
| Cystadenocarcinoma, Metastatic, Ovary | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Fat, Schwannoma Malignant, Metastatic, Uterus | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Pancreas | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
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M .. Missing tissue
 A .. Autolysis precludes evaluation
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| WISTAR HAN RATS FEMALE
12.5 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | * TOTALS | | |
|---|-------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|----------|--------|--------|
| | 057711 | 077123 | 077230 | 077333 | 077633 | 077133 | 077733 | 077133 | 077733 | 077733 | 077538 | 077738 | 077733 | 077733 | 077430 | 077733 | 077638 | 077723 | 077733 | 077733 | | 077733 | 077733 |
| ANIMAL ID | 00326 | 00332 | 00332 | 00332 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 |
| Adenocarcinoma, Metastatic, Uterus | | | X | | | | | | | | | | | | | | | | | | | | 1 |
| Salivary Glands | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Stomach, Forestomach | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Stomach, Glandular | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| CARDIOVASCULAR SYSTEM | | | | | | | | | | | | | | | | | | | | | | | |
| Blood Vessel | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Heart | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| ENDOCRINE SYSTEM | | | | | | | | | | | | | | | | | | | | | | | |
| Adrenal Cortex | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Adenocarcinoma, Metastatic, Uterus | | | X | | | | | | | | | | | | | | | | | | | | 1 |
| Leukemia Mononuclear | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Adrenal Medulla | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Islets, Pancreatic | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Parathyroid Gland | + | M | + | + | + | M | M | + | + | + | + | + | M | + | + | + | + | + | M | M | + | + | 44 |
| Pituitary Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Schwannoma Malignant, Metastatic, Harderian Gland | | | | | | | | X | | | | | | | | | | | | | | | 1 |
| Pars Distalis, Adenoma | | X | X | X | | X | | | X | X | X | | X | | | X | X | | | | X | | 24 |
| Thyroid Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS FEMALE
12.5 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | * TOTALS | |
|------------------------------------|-------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|----------|---|
| | 057711 | 007723 | 007723 | 007723 | 007723 | 007723 | 007723 | 007723 | 007723 | 007723 | 007723 | 007723 | 007723 | 007723 | 007723 | 007723 | 007723 | 007723 | 007723 | 007723 | 007723 | 007723 | 007723 | 007723 | | |
| ANIMAL ID | 00326 | 00327 | 00328 | 00329 | 00330 | 00331 | 00332 | 00333 | 00334 | 00335 | 00336 | 00337 | 00338 | 00339 | 00340 | 00341 | 00342 | 00343 | 00344 | 00345 | 00346 | 00347 | 00348 | 00349 | 00350 | |
| C-cell, Adenoma | | | | | | X | | | | | | | | | | | | | | | | | | | | 4 |
| Follicular Cell, Adenoma | | X | | | | | | | | | | | | | | | | | | | | | | | | 4 |
| Follicular Cell, Carcinoma | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |

GENERAL BODY SYSTEM

NONE

GENITAL SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|
| Clitoral Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Ovary | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Cystadenocarcinoma | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Cystadenoma | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Granulosa Cell Tumor Malignant | | | | | | | | | | | | | X | | | | | | | | | | | | | 1 |
| Uterus | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Adenocarcinoma | | | X | | | | X | | | | | | | | | | | X | X | | | | | | | 4 |
| Leiomyoma | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Polyp Stromal | | | | | | X | | | | X | X | | | | X | X | | | | | | | | | | 10 |
| Polyp Stromal, Multiple | | | | | | | | | | | | X | | | | | | | | | | | | | | 3 |
| Schwannoma Malignant | | | | X | | | | | | | | | | | | | | | | | | | | | | 2 |
| Cervix, Granular Cell Tumor Benign | | | | | | | | | | | | | | | | | | | | | | | | | | 3 |
| Serosa, Cystadenocarcinoma, Metastatic, Ovary | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Vagina | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Granular Cell Tumor Benign | | | | | | | | | | | | | | | | | | | | | | | | | | 1 |

HEMATOPOIETIC SYSTEM

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| Wistar Han Rats Female
12.5 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | * TOTALS | | |
|--|-------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|----------|--------|--------|
| | 057711 | 007723 | 007732 | 007730 | 007733 | 007737 | 007732 | 007735 | 007738 | 007733 | 007738 | 007733 | 007738 | 007732 | 007739 | 007732 | 007733 | 007737 | 007731 | 007733 | | 007733 | 007732 |
| ANIMAL ID | 000326 | 000307 | 000308 | 000309 | 000310 | 000311 | 000312 | 000313 | 000314 | 000315 | 000316 | 000317 | 000318 | 000319 | 000320 | 000321 | 000322 | 000323 | 000324 | 000325 | 000326 | 000327 | |
| Bone Marrow | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Lymph Node | | | | | | | | | | | | | | | | | | | | | | | 3 |
| Lumbar, Adenocarcinoma, Metastatic, Uterus | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Renal, Adenocarcinoma, Metastatic, Uterus | | | | | | | | | | | | | | | | | | | | | | | 2 |
| Lymph Node, Bronchial | + | + | + | M | + | + | + | + | + | M | + | M | + | + | + | + | + | + | M | + | + | + | 44 |
| Lymph Node, Mandibular | M | + | + | + | + | M | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 48 |
| Lymph Node, Mediastinal | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 47 |
| Lymph Node, Mesenteric | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Lymphoma Malignant | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Schwannoma Malignant, Metastatic, Uterus | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Spleen | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Leukemia Mononuclear | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Thymus | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Lymphoma Malignant | | | | | | | | | | | | | | | | | | | | | | | 1 |
| INTEGUMENTARY SYSTEM | | | | | | | | | | | | | | | | | | | | | | | |
| Mammary Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Adenoma | | | X | | | | | | | | | | | | | | | | | | X | | 3 |
| Carcinoma | | | | | | | | | | X | | | | | | | | | | | X | | 4 |
| Fibroadenoma | | | X | | | | | | | | | | | | | | | | | | X | X | 10 |
| Fibroadenoma, Multiple | | | | | | X | | | | | | | | | | | X | | | | | | 3 |
| Skin | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS FEMALE
12.5 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | * TOTALS |
|------------------------------------|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|----------|
| | 0571 | 0731 | 0771 | 0772 | 0773 | 0776 | 0777 | 0778 | 0779 | 0771 | 0772 | 0773 | 0775 | 0777 | 0778 | 0779 | 0774 | 0777 | 0776 | 0777 | 0777 | 0777 | 0777 | 0777 | |
| ANIMAL ID | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | |
| | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | |
| | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |

Subcutaneous Tissue, Adenocarcinoma, Metastatic, Uterus X 1
 Subcutaneous Tissue, Lipoma X 1

MUSCULOSKELETAL SYSTEM

Bone + 50
 Skeletal Muscle + 7
 Adenocarcinoma, Metastatic, Uterus X 2

NERVOUS SYSTEM

Brain + 50
 Granular Cell Tumor Benign X 2
 Schwannoma Malignant, Metastatic, Harderian Gland X 1
 Peripheral Nerve + 5
 Trigeminal, Schwannoma Malignant, Metastatic, Harderian Gland X 1
 Spinal Cord + 5

RESPIRATORY SYSTEM

Larynx + 50
 Lung + 50
 Adenocarcinoma, Metastatic, Uterus X 1
 Leukemia Mononuclear 1

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
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 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS FEMALE
12.5 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | * TOTALS | |
|---|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|--|
| | 0571 | 0731 | 0771 | 0772 | 0773 | 0776 | 0777 | 0771 | 0777 | 0777 | 0777 | 0775 | 0777 | 0777 | 0777 | 0774 | 0777 | 0776 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | | |
| ANIMAL ID | 00326 | 00332 | 00332 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | 00333 | | |
| Nose | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | | |
| Trachea | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | | |
| SPECIAL SENSES SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Eye | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | | |
| Optic Nerve, Schwannoma Malignant,
Metastatic, Harderian Gland | | | | | | | | | | | | | | | | | | | | | | | | 1 | | |
| Harderian Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | | |
| Schwannoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | 1 | | |
| URINARY SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Kidney | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | | |
| Urinary Bladder | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | | |
| SYSTEMIC LESIONS | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Multiple Organ | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | | |
| Leukemia Mononuclear | | | | | | | | | | | | | | | | | | | | | | | | 1 | | |
| Lymphoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | 1 | | |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS FEMALE | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | | females
(cont...) |
|------------------------|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|----------------------|
| | 0723 | 0758 | 0761 | 0773 | 0777 | 0777 | 0777 | 0766 | 0777 | 0777 | 0755 | 0777 | 0777 | 0744 | 0777 | 0777 | 0766 | 0744 | 0777 | 0777 | 0766 | 0744 | 0755 | 0777 | 0777 | |
| 25 ppm | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | |
| | 5001 | 5002 | 5003 | 5004 | 5005 | 5006 | 5007 | 5008 | 5009 | 5010 | 5011 | 5012 | 5013 | 5014 | 5015 | 5016 | 5017 | 5018 | 5019 | 5020 | 5021 | 5022 | 5023 | 5024 | 5025 | |

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Blood Vessel | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Heart | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |

ENDOCRINE SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Adrenal Cortex
Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Schwannoma Malignant, Metastatic, Uterus | X | | | | | | | | | | | | | | | | | | | | | | | | |
| Adrenal Medulla | + | + | + | + | + | + | M | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Islets, Pancreatic | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Parathyroid Gland
Adenoma | + | + | + | + | + | + | + | + | M | M | + | M | + | + | + | + | + | + | M | + | + | + | + | + | |
| Pituitary Gland
Pars Distalis, Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Thyroid Gland
C-cell, Adenoma | | | X | | X | | | X | | | | X | X | X | X | X | | X | | X | X | | X | | |
| Follicular Cell, Adenoma | | | | | | X | | | | | | | | | | | | | | | | | | | |

GENERAL BODY SYSTEM

NONE

GENITAL SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Clitoral Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
|----------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue
 M .. Missing tissue
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 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
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 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS FEMALE | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | females
(cont...) | |
|------------------------|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|----------------------|--|
| | 0723 | 0589 | 0617 | 0732 | 0774 | 0772 | 0773 | 0671 | 0773 | 0774 | 0571 | 0771 | 0771 | 0474 | 0777 | 0773 | 0672 | 0473 | 0575 | 0777 | 0773 | 0676 | 0474 | 0575 | | |
| 25 ppm | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | 0000 | | |
| | 5001 | 5002 | 5003 | 5004 | 5005 | 5006 | 5007 | 5008 | 5009 | 5010 | 5011 | 5012 | 5013 | 5014 | 5015 | 5016 | 5017 | 5018 | 5019 | 5020 | 5021 | 5022 | 5023 | 5024 | 5025 | |

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|--|
| Ovary | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | |
| Granulosa Cell Tumor Malignant | | | | | | | | | | | | | | | | | | | | | | | | X | | |
| Uterus | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | | |
| Adenocarcinoma | | | | | | X | | | | | | | | | | | | | | | | | | | | |
| Polyp Stromal | | X | | | | | | | | | | | | | | | | | | | | | X | | | |
| Sarcoma Stromal | | | | | | | | | | X | | | | | | | X | | | | | X | | | | |
| Schwannoma Malignant | X | | | | | | | | | | | | | | | | | | | | | | | X | | |
| Cervix, Hemangioma | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cervix, Schwannoma Malignant | | X | | | | | | | | | | | | | | | | | | | | | | | | |
| Cervix, Squamous Cell Carcinoma | | | | | X | | | | | | | | | | | | | | | | | | | | | |
| Vagina | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Polyp | | | | | | | | | | | | | | | | | | | | | | | | | + | |
| Schwannoma Malignant, Metastatic, Uterus | | | | | | | | | | | | | | | | | | | | | | | | | X | |

HEMATOPOIETIC SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bone Marrow | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Lymph Node | | | | | | | | | | | | | | | | | | | | | | | | | + |
| Lymph Node, Bronchial | + | M | + | + | + | + | + | + | + | + | + | + | M | + | + | + | + | M | + | + | + | M | + | M | |
| Lymph Node, Mandibular | M | + | + | + | + | + | + | + | + | + | + | M | + | + | + | + | + | + | + | + | + | + | + | + | |
| Lymph Node, Mediastinal | + | + | + | + | + | + | + | + | + | + | + | M | + | + | + | + | + | + | + | + | + | + | + | + | |
| Lymph Node, Mesenteric | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Schwannoma Malignant, Metastatic, Uterus | | X | | | | | | | | | | | | | | | | | | | | | | | |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
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Experiment Number: 20725 - 03
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 Lab: BNW

| WISTAR HAN RATS FEMALE | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | | ANIMAL ID | females
(cont...) | |
|------------------------|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|-----------|----------------------|------|
| | 0723 | 0758 | 0761 | 0773 | 0777 | 0777 | 0777 | 0766 | 0777 | 0777 | 0755 | 0777 | 0777 | 0744 | 0777 | 0777 | 0766 | 0744 | 0777 | 0777 | 0766 | 0744 | 0755 | 0777 | 0777 | | | 0766 |
| 25 ppm | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spleen | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Thymus | + | + | + | M | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Lymphoma Malignant | | | | | | | | X | | | | | | | | | | | | X | | | | | | | |

INTEGUMENTARY SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mammary Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Adenoma | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Carcinoma | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Fibroadenoma | | | | | X | X | | | | | | | | | | X | | | X | | | | | | | X | |
| Fibroadenoma, Multiple | | | | | | | X | | | X | | | | | | | | | | | | | | | | | |
| Skin | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Subcutaneous Tissue, Lipoma | | | | | | | | X | | | | | | | | | | | | | | | | | | | |

MUSCULOSKELETAL SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bone | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Skeletal Muscle | | | | | + | | | | + | | | | | + | | | | | | | | | | | | | + |

NERVOUS SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Brain | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Granular Cell Tumor Benign | | | | | | | | | | | | | | | | | | | | | | | | | | X | |
| Peripheral Nerve | | | | | + | | | | + | | | | | + | | | | | | | | | | | | + | |
| Spinal Cord | | | | | + | | | | + | | | | | + | | | | | | | | | | | | | + |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS FEMALE | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | * TOTALS |
|------------------------|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| | 0731 | 0739 | 0772 | 0772 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | |
| 25 ppm | 00526 | 00527 | 00528 | 00529 | 00530 | 00531 | 00532 | 00533 | 00534 | 00535 | 00536 | 00537 | 00538 | 00539 | 00540 | 00541 | 00542 | 00543 | 00544 | 00545 | 00546 | 00547 | 00548 | 00549 | 50 |

ALIMENTARY SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|
| Esophagus | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Intestine Large, Cecum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Intestine Large, Colon | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Intestine Large, Rectum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Intestine Small, Duodenum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Intestine Small, Ileum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Intestine Small, Jejunum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Liver | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Hepatocellular Adenoma | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Schwannoma Malignant, Metastatic, Uterus | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Mesentery | | + | | | | | | | | | + | | | | | | | | | | | + | | | 4 |
| Pancreas | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Salivary Glands | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Stomach, Forestomach | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Stomach, Glandular | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |

CARDIOVASCULAR SYSTEM

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS FEMALE
25 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | * TOTALS |
|----------------------------------|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| | 0731 | 0739 | 0772 | 0772 | 0772 | 0772 | 0772 | 0772 | 0772 | 0772 | 0772 | 0772 | 0772 | 0772 | 0772 | 0772 | 0772 | 0772 | 0772 | 0772 | 0772 | 0772 | 0772 | 0772 | |
| ANIMAL ID | 00526 | 00527 | 00528 | 00529 | 00530 | 00531 | 00532 | 00533 | 00534 | 00535 | 00536 | 00537 | 00538 | 00539 | 00540 | 00541 | 00542 | 00543 | 00544 | 00545 | 00546 | 00547 | 00548 | 00549 | |
| Blood Vessel | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Heart | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |

ENDOCRINE SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|
| Adrenal Cortex | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Adenoma | | | | | | | | | | | | | | | | | | | | | | X | | 1 |
| Schwannoma Malignant, Metastatic, Uterus | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Adrenal Medulla | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 49 |
| Islets, Pancreatic | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Parathyroid Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 46 |
| Adenoma | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Pituitary Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Pars Distalis, Adenoma | | X | | X | | | X | X | | | X | X | X | X | | X | X | | | X | | | X | 24 |
| Thyroid Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| C-cell, Adenoma | | | | | | | | | | | | | | | | | | | | | | X | | 3 |
| Follicular Cell, Adenoma | | | | | | | | | | | | | | | | | | | | | | | | 1 |

GENERAL BODY SYSTEM

NONE

GENITAL SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | |
|----------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|
| Clitoral Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
|----------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

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 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

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 2,3-Butanedione
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 Lab: BNW

| WISTAR HAN RATS FEMALE
25 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | * TOTALS |
|--|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| | 0731 | 0731 | 0732 | 0732 | 0733 | 0733 | 0733 | 0733 | 0733 | 0733 | 0733 | 0733 | 0733 | 0733 | 0733 | 0733 | 0733 | 0733 | 0733 | 0733 | 0733 | 0733 | 0733 | 0733 | |
| ANIMAL ID | 00526 | 00527 | 00528 | 00529 | 00530 | 00531 | 00532 | 00533 | 00534 | 00535 | 00536 | 00537 | 00538 | 00539 | 00540 | 00541 | 00542 | 00543 | 00544 | 00545 | 00546 | 00547 | 00548 | 00549 | |
| Ovary | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Granulosa Cell Tumor Malignant | | | | | | | | | X | | | | | | | | | | | | | | | | |
| Uterus | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Adenocarcinoma | | | | | | | | | | | | | | | | | | | | | | X | | | |
| Polyp Stromal | | | | X | | | | | | | | | | | | | | | | | | | | | |
| Sarcoma Stromal | | | | | | | | | | | | | | | | | | | | | | X | | | |
| Schwannoma Malignant | | | | | | | | | | | X | | | | | | | | | | | | | | |
| Cervix, Hemangioma | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cervix, Schwannoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cervix, Squamous Cell Carcinoma | | | | | | | | | | | | | | | | | | | | | | | | | |
| Vagina | | | | | | | | | | | | | | | | | | | | | | | | | |
| Polyp | | | | | | | | | | | | | | | | | | | | | | | | | |
| Schwannoma Malignant, Metastatic, Uterus | | | | | | | | | | | | | | | | | | | | | | | | | |

HEMATOPOIETIC SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bone Marrow | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Lymph Node | | | | | | | | | | | | | | | | | | | | | | | | |
| Lymph Node, Bronchial | + | + | + | + | + | + | + | + | M | + | + | + | + | + | + | M | + | + | + | + | + | + | + | + |
| Lymph Node, Mandibular | + | + | + | + | + | + | + | + | + | + | M | + | + | + | + | M | + | + | + | + | + | + | + | M |
| Lymph Node, Mediastinal | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | M | + |
| Lymph Node, Mesenteric | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Schwannoma Malignant, Metastatic, Uterus | | | | | | | | | | | | | | | | | | | | | | | | |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
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Experiment Number: 20725 - 03
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 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

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 2,3-Butanedione
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| WISTAR HAN RATS FEMALE
25 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | * TOTALS | | |
|----------------------------------|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|-------|------|
| | 0731 | 0739 | 0772 | 0772 | 0772 | 0775 | 0775 | 0775 | 0775 | 0775 | 0775 | 0775 | 0775 | 0775 | 0775 | 0775 | 0775 | 0775 | 0775 | 0775 | | 0775 | 0775 |
| ANIMAL ID | 00526 | 00557 | 00558 | 00559 | 00560 | 00561 | 00562 | 00563 | 00564 | 00565 | 00566 | 00567 | 00568 | 00569 | 00570 | 00571 | 00572 | 00573 | 00574 | 00575 | 00576 | 00577 | |
| Spleen | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Thymus | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 49 |
| Lymphoma Malignant | | | | | | | | | | | | | | | | | | | X | | | | 3 |
| INTEGUMENTARY SYSTEM | | | | | | | | | | | | | | | | | | | | | | | |
| Mammary Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Adenoma | X | | | | | | | | | | | X | | | | | | | | | | | 2 |
| Carcinoma | | | | | | | | | | | | | | | | | | | | | X | | 1 |
| Fibroadenoma | | | X | X | | | | | | | | | | | | | | | | X | | X | 9 |
| Fibroadenoma, Multiple | | | | | | | | | | | | | | | X | | | | | | | | 3 |
| Skin | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Subcutaneous Tissue, Lipoma | | | | | | | | | | | | | | | | | | | | | | | 1 |
| MUSCULOSKELETAL SYSTEM | | | | | | | | | | | | | | | | | | | | | | | |
| Bone | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Skeletal Muscle | | | | | | | | | | | | | | | | | | | | | | + | 5 |
| NERVOUS SYSTEM | | | | | | | | | | | | | | | | | | | | | | | |
| Brain | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Granular Cell Tumor Benign | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Peripheral Nerve | | | | | | | | | | | | | | | | | | | | | | + | 5 |
| Spinal Cord | | | | | | | | | | | | | | | | | | | | | | + | 5 |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
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M .. Missing tissue
 A .. Autolysis precludes evaluation
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|------------------------|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|-------|-------|-------|-------|
| | 0731 | 0739 | 0772 | 0772 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | 0777 | | 0777 | 0777 | | |
| 25 ppm | 00526 | 00527 | 00528 | 00529 | 00530 | 00531 | 00532 | 00533 | 00534 | 00535 | 00536 | 00537 | 00538 | 00539 | 00540 | 00541 | 00542 | 00543 | 00544 | 00545 | 00546 | 00547 | 00548 | 00549 | 00550 |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

RESPIRATORY SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|
| Larynx | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Lung | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Nose | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Trachea | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |

SPECIAL SENSES SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|
| Eye | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Iris, Melanoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Harderian Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |

URINARY SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|
| Kidney | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Urinary Bladder | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Schwannoma Malignant, Metastatic, Uterus | | | | | | | | | | | | | | | | | | | | | | | | | 1 |

SYSTEMIC LESIONS

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|--------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|
| Multiple Organ | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Lymphoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | | 3 |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS FEMALE | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | females
(cont...) |
|------------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|----------------------|
| | 0
7
3
1 | 0
7
3
2 | 0
7
3
1 | 0
5
4
4 | 0
7
3
1 | 0
7
3
3 | 0
5
7
1 | 0
7
2
5 | 0
6
3
3 | 0
7
3
3 | 0
6
2
9 | 0
6
3
5 | 0
4
9
1 | 0
7
3
1 | 0
7
3
1 | 0
7
3
3 | 0
7
3
2 | 0
7
3
4 | 0
7
3
2 | 0
4
3
5 | 0
7
3
2 | 0
7
3
2 | 0
7
3
2 | | |
| 50 ppm | ANIMAL ID | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0
7
0
1 | 0
0
7
2 | 0
0
7
3 | 0
0
7
4 | 0
0
7
5 | 0
0
7
6 | 0
0
7
7 | 0
0
7
8 | 0
0
7
9 | 0
0
7
0 | 0
0
7
1 | 0
0
7
2 | 0
0
7
3 | 0
0
7
4 | 0
0
7
5 | 0
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7
6 | 0
0
7
7 | 0
0
7
8 | 0
0
7
9 | 0
0
7
0 | 0
0
7
1 | 0
0
7
2 | 0
0
7
3 | 0
0
7
4 | |

ALIMENTARY SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Esophagus | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Intestine Large, Cecum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Intestine Large, Colon | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Intestine Large, Rectum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Intestine Small, Duodenum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Intestine Small, Ileum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Intestine Small, Jejunum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Liver | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Adenocarcinoma, Metastatic, Uterus | | | | | | | | | | | | | | | | | | | | | | | | |
| Lymphoma Malignant | | | | | | | | | | | | | | | | | | | | | | | X | |
| Mesentery | | | | | | | | | | | | | | | | | | | | | | | | |
| Adenocarcinoma, Metastatic, Uterus | | | | | | | | | | | | | | | | | | | | | | | | + |
| Pancreas | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Schwannoma Malignant, Metastatic, Uterus | | | | | | | | | | | | | | | | | | | | | | | | |
| Acinus, Adenocarcinoma, Metastatic, Uterus | | | | | | | | | | | | | | | | | | | | | | | | |
| Salivary Glands | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Stomach, Forestomach | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS FEMALE
50 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | ANIMAL ID | females
(cont...) |
|---|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|---|-----------|----------------------|
| | 0
7
3
1 | 0
7
3
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7
3
1 | 0
5
4
4 | 0
7
3
1 | 0
7
3
3 | 0
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1 | 0
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2
5 | 0
6
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3 | 0
7
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9 | 0
6
2
5 | 0
4
3
1 | 0
7
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1 | 0
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4 | 0
7
3
2 | 0
4
3
5 | 0
7
3
2 | 0
7
3
2 | 0
7
3
2 | | | |
| Stomach, Glandular
Adenocarcinoma, Metastatic, Uterus | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| CARDIOVASCULAR SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | |
| Blood Vessel | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Heart | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| ENDOCRINE SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | |
| Adrenal Cortex
Adenocarcinoma, Metastatic, Uterus
Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Adrenal Medulla
Pheochromocytoma Malignant | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Islets, Pancreatic | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Parathyroid Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | M | + | + | M | + | M | + | + | + | |
| Pituitary Gland
Lymphoma Malignant
Pars Distalis, Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | X | + | + | |
| Thyroid Gland
C-cell, Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | X | + | |
| GENERAL BODY SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
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 Species/Strain: RATS/Wistar Han

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 2,3-Butanedione
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 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS FEMALE
50 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | | ANIMAL ID | females
(cont...) |
|----------------------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|-----------|----------------------|
| | 0
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9 | 0
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5 | 0
4
9
1 | 0
7
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1 | 0
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3 | 0
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4 | 0
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8 | 0
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9 | 0
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0 | 0
7
0
1 | 0
7
0
2 | 0
7
0
3 | 0
7
0
4 | 0
7
0
5 | | |

NONE

GENITAL SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Clitoral Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | M | + | + | + | + | + |
| Ovary | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Adenocarcinoma, Metastatic, Uterus | | | | | | | | | | | | | | | | | | | | | | | | | |
| Granulosa-Theca Tumor Malignant | | | | | | | | | | | | | | | | | | | | | | | | | |
| Sertoli Cell Tumor Benign | | | | | | | | | | | | | | | | | | | | | | | | | |
| Thecoma Benign | | | | | | | | | | | | | | | | | | | | | | | | | |
| Uterus | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | |
| Adenocarcinoma | | | X | | | | | | | | | | | | | | | | | | | | | | |
| Adenoma | | | | | | | | | | | | | | X | | X | | | | | | | | | |
| Hemangioma | | | | | | | | | | | | | | | | | | X | | | | | | | |
| Polyp Stromal | | | | | X | | | | | | X | | X | X | X | | | | | | | | X | X | |
| Schwannoma Malignant | | | | | | | | | | | | | X | | | | | | | | | | | | |

HEMATOPOIETIC SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bone Marrow | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Lymphoma Malignant | | | | | | | | | | | | | | | | | | | | | | | X | |
| Lymph Node | | | | | | | | | | | + | | | + | + | | | | | | | | | |
| Lymph Node, Bronchial | + | M | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Lymphoma Malignant | | | | | | | | | | | | | | | | | | | | | | X | | |
| Lymph Node, Mandibular | + | + | + | + | + | + | M | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
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 2,3-Butanedione
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Date Report Requested: 04/12/2016
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 Lab: BNW

| WISTAR HAN RATS FEMALE | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | females
(cont...) |
|------------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|----------------------|
| | 0
7
3
1 | 0
7
3
2 | 0
7
3
1 | 0
5
4
4 | 0
7
3
1 | 0
7
3
1 | 0
5
7
2 | 0
7
2
5 | 0
6
3
3 | 0
7
3
3 | 0
6
2
9 | 0
6
3
5 | 0
4
9
1 | 0
7
3
1 | 0
7
3
1 | 0
7
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3 | 0
7
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2 | 0
7
3
4 | 0
7
3
2 | 0
4
3
5 | 0
7
3
2 | 0
7
3
2 | 0
7
3
2 | | |
| 50 ppm | ANIMAL ID | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0
7
0
1 | 0
0
7
2 | 0
0
7
3 | 0
0
7
4 | 0
0
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5 | 0
0
7
6 | 0
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7 | 0
0
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8 | 0
0
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9 | 0
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1 | 0
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2 | 0
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3 | 0
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4 | 0
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5 | 0
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7 | 0
0
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8 | 0
0
7
9 | 0
0
7
0 | 0
0
7
1 | 0
0
7
2 | 0
0
7
3 | 0
0
7
4 | |

NERVOUS SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Brain | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Granular Cell Tumor Benign | | | | | | | | | | | | | | | | | | | | | | | | |
| Oligodendroglioma Benign | | | | | | | | | | | | | | | | | | | | | | | | |
| Meninges, Lymphoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | |
| Peripheral Nerve | | | | | | | | | | | | | | | | | | | | | | | | |
| Lymphoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | |
| Spinal Cord | | | | | | | | | | | | | | | | | | | | | | | | |

RESPIRATORY SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Larynx | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Lung | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Alveolar/Bronchiolar Adenoma | | | | | | | | | | | | | | | | | | | | | | | | |
| Schwannoma Malignant, Metastatic, Uterus | | | | | | | | | | | | | | | | | | | | | | | | |
| Mediastinum, Adenocarcinoma, Metastatic, Uterus | | | | | | | | | | | | | | | | | | | | | | | | |
| Nose | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
| Lymphoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | |
| Squamous Cell Carcinoma | | | | | | | | | | | | | | | | | | | | | | | | |
| Trachea | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |

SPECIAL SENSES SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Eye | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + |
|-----|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
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 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS FEMALE | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | females
(cont...) | |
|------------------------|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------------------|--|
| | 0731 | 0732 | 0731 | 0734 | 0731 | 0733 | 0731 | 0735 | 0737 | 0736 | 0736 | 0734 | 0737 | 0737 | 0737 | 0737 | 0737 | 0737 | 0737 | 0737 | 0734 | 0737 | 0737 | 0737 | | |
| 50 ppm | 00700 | 00700 | 00700 | 00700 | 00700 | 00700 | 00700 | 00700 | 00700 | 00700 | 00700 | 00700 | 00700 | 00700 | 00700 | 00700 | 00700 | 00700 | 00700 | 00700 | 00700 | 00700 | 00700 | 00700 | | |
| ANIMAL ID | 7701 | 7702 | 7703 | 7704 | 7705 | 7706 | 7707 | 7708 | 7709 | 7710 | 7711 | 7712 | 7713 | 7714 | 7715 | 7716 | 7717 | 7718 | 7719 | 7720 | 7721 | 7722 | 7723 | 7724 | 7725 | |

Harderian Gland

+ +

URINARY SYSTEM

Kidney
Lymphoma Malignant

+ X + + +

Urinary Bladder
Schwannoma Malignant, Metastatic, Uterus

+ +

SYSTEMIC LESIONS

Multiple Organ
Lymphoma Malignant

+ X + + +

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
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M .. Missing tissue
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 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| Wistar Han Rats Female
50 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | * TOTALS |
|----------------------------------|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|
| | 0697 | 06337 | 07332 | 07732 | 07733 | 07733 | 07733 | 07733 | 07733 | 07733 | 07733 | 07733 | 07733 | 07733 | 07733 | 07733 | 07733 | 07733 | 07733 | 07733 | 07733 | 07733 | 07733 | 07733 | |
| ANIMAL ID | 00726 | 00727 | 00728 | 00729 | 00730 | 00731 | 00732 | 00733 | 00734 | 00735 | 00736 | 00737 | 00738 | 00739 | 00740 | 00741 | 00742 | 00743 | 00744 | 00745 | 00746 | 00747 | 00748 | 00749 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | |
| | 9 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | |
| | 7 | 3 | 1 | 2 | 2 | 3 | 2 | 3 | 3 | 1 | 1 | 7 | 2 | 9 | 3 | 3 | 1 | 5 | 5 | 2 | 7 | 3 | 2 | 2 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | |
| | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | |
| | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | |

ALIMENTARY SYSTEM

| | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|----|
| Esophagus | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Intestine Large, Cecum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Intestine Large, Colon | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Intestine Large, Rectum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Intestine Small, Duodenum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Intestine Small, Ileum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Intestine Small, Jejunum | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Liver | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Adenocarcinoma, Metastatic, Uterus | | | | | | | | | | | | | | | | | | | | | X | | | 1 |
| Lymphoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Mesentery | | | | | | | | | | | | | | | | | | | | | | | | 4 |
| Adenocarcinoma, Metastatic, Uterus | | | | | | | | | | | | | | | | | | | | | | | | 1 |
| Pancreas | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Schwannoma Malignant, Metastatic, Uterus | | | X | | | | | | | | | | | | | | | | | | | | | 1 |
| Acinus, Adenocarcinoma, Metastatic, Uterus | | | | | | | | | | | | | | | | | | | | | | X | | 1 |
| Salivary Glands | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Stomach, Forestomach | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
 2,3-Butanedione
 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
 Time Report Requested: 16:27:54
 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS FEMALE
50 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | | | | | * TOTALS | | | |
|---|-------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|----------|---|---|---------------|
| | 06797 | 06797 | 06797 | 06797 | 06797 | 06797 | 06797 | 06797 | 06797 | 06797 | 06797 | 06797 | 06797 | 06797 | 06797 | 06797 | 06797 | 06797 | 06797 | 06797 | 06797 | 06797 | 06797 | 06797 | | | | |
| ANIMAL ID | 007266 | 007267 | 007268 | 007269 | 007270 | 007271 | 007272 | 007273 | 007274 | 007275 | 007276 | 007277 | 007278 | 007279 | 007280 | 007281 | 007282 | 007283 | 007284 | 007285 | 007286 | 007287 | 007288 | 007289 | | | | |
| Stomach, Glandular
Adenocarcinoma, Metastatic, Uterus | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | X | + | + | + | + | + | 50
1 |
| CARDIOVASCULAR SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Blood Vessel | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Heart | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| ENDOCRINE SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Adrenal Cortex
Adenocarcinoma, Metastatic, Uterus
Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | X | + | + | + | + | + | 50
1
1 |
| Adrenal Medulla
Pheochromocytoma Malignant | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
1 |
| Islets, Pancreatic | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 |
| Parathyroid Gland | + | M | + | + | + | + | + | + | + | M | + | + | M | + | + | M | M | + | + | + | + | + | + | + | + | + | + | 42 |
| Pituitary Gland
Lymphoma Malignant
Pars Distalis, Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
1
23 |
| Thyroid Gland
C-cell, Adenoma | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50
3 |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

Experiment Number: 20725 - 03
 Test Type: CHRONIC
 Route: RESPIRATORY EXPOSURE WHOLE BODY
 Species/Strain: RATS/Wistar Han

P04: NEOPLASMS BY INDIVIDUAL ANIMAL
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 CAS Number: 431-03-8

Date Report Requested: 04/12/2016
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 First Dose M/F: 08/17/09 / 08/17/09
 Lab: BNW

| WISTAR HAN RATS FEMALE
50 ppm | DAY ON TEST | | | | | | | | | | | | | | | | | | | | * TOTALS | | | | | |
|------------------------------------|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----------|-------|-------|-------|-------|--|
| | 0697 | 06337 | 07777 | 07777 | 07777 | 07777 | 07777 | 07777 | 07777 | 07777 | 07777 | 07777 | 07777 | 07777 | 07777 | 07777 | 07777 | 07777 | 07777 | 07777 | | 07777 | | | | |
| ANIMAL ID | 00726 | 00727 | 00728 | 00729 | 00730 | 00731 | 00732 | 00733 | 00734 | 00735 | 00736 | 00737 | 00738 | 00739 | 00740 | 00741 | 00742 | 00743 | 00744 | 00745 | 00746 | 00747 | 00748 | 00749 | 00750 | |
| Lymphoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Lymph Node, Mediastinal | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Adenocarcinoma, Metastatic, Uterus | | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Lymphoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Lymph Node, Mesenteric | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Spleen | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Adenocarcinoma, Metastatic, Uterus | | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Lymphoma Malignant | | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Thymus | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| INTEGUMENTARY SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Mammary Gland | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | |
| Adenoma | | | | | | | | | | | | | | | | | | | | | | | | | 1 | |
| Carcinoma | | | | X | | | | | | | X | | | | X | | X | | | | | | | 8 | | |
| Carcinoma, Multiple | | | | | | | | | | | | | | | | | | | | | | | | 1 | | |
| Fibroadenoma | | | | | X | | X | | | | | | | | | | | | | | | X | X | 8 | | |
| Fibroadenoma, Multiple | | | | | | | | | | | | | | | | | | | | | | | | 3 | | |
| Skin | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | | |
| Subcutaneous Tissue, Hibernoma | | | | | | | | | | | | | | | | | | | | | | | | 2 | | |
| MUSCULOSKELETAL SYSTEM | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Bone | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | + | 50 | | |
| Skeletal Muscle | + | | | | | | | | | | | + | | | | | | | | | + | | | 5 | | |

* .. Total animals with tissue examined microscopically; Total animals with tumor
 + .. Tissue examined microscopically
 X .. Lesion present
 I .. Insufficient tissue

M .. Missing tissue
 A .. Autolysis precludes evaluation
 BLANK .. Not examined microscopically

