Data Requirement

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STUDY NO. 03-4246

PETROLEUM COKE: REPRODUCTION/DEVELOPMENTAL TOXICITY SCREENING STUDY IN RATS VIA NOSE-ONLY INHALATION EXPOSURES

Final Report

VOLUME II OF II

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1. INTRODUCTION

This appendix presents the methodology for exposure generation, monitoring and results.

2. MATERIALS AND METHODS

2.1. HUSBANDRY DURING EXPOSURE PERIODS

2.1.1. HOUSING

Animals were individually housed in polycarbonate tubes attached to a cast aluminum and alloy 40 Liter nose-only exposure chamber. The placement of the tubes in the nose-only chamber was rotated at each exposure to ensure uniform exposure of the animals. A description of the animal rotation is included in the raw data.

2.1.2. FEED

None was provided during exposure.

2.1.3. WATER

None was provided during exposure.

2.1.4. ENVIRONMENTAL CONDITIONS

Chamber temperature and relative humidity were recorded every half-hour during exposure and maintained, to the maximum extent possible, within the ranges presented below. Excursions outside the specified range did not affect the integrity of the study.

Temperature

Desired: 20 to 24°C
Actual: 18 to 24°C

Relative Humidity

Desired: 40 to 60%
Actual: 10 to 68%

2.2. TEST SUBSTANCE ADMINISTRATION AND CHAMBER OPERATIONS

2.2.1. ROUTE OF ADMINISTRATION

Inhalation, as a dust, via nose-only exposures.

2.2.2. TEST SUBSTANCE ADMINISTRATION

The test substance was administered as a dust in the breathing air of the animals by nose-only inhalation exposure. The test atmosphere was generated by an appropriate procedure (Wright Dust Feeder with a cyclone pre-collector) determined during pre-study trials. The trials were performed (at least two 6-hour periods) to select the optimal set of conditions to generate a stable and uniform atmosphere at the target exposure levels with a mass median aerodynamic diameter of 1.0 - 3.0 microns.

2.2.3. TARGET EXPOSURE LEVELS

Group 1 - 0 mg/m^3
Group 2 - 30 mg/m^3
Group 3 - 100 mg/m^3
Group 4 - 300 mg/m^3

2.2.4. DURATION AND FREQUENCY OF ADMINISTRATION

Male rats were exposed once daily, seven days/week for 2 weeks prior to mating initiation. Exposure of male rats continued during the mating and post-mating periods until euthanized on the day after a minimum exposure of 28 days. Female rats (12/group) were exposed once daily, seven days/week for at least two weeks prior to mating initiation. Female rats continued to be treated once daily during the mating period, but were separated from the males during actual exposure. Once mated, female rats were treated once daily during gestation (days 0-19). Female rats without evidence of mating continued to be treated for up to 19 days (6 hours/day) following completion of the mating period and then held for up to an additional 7 days. In the event that female rats without evidence of mating appeared pregnant (based on observations and body

weights), exposure was terminated on the estimated Gestation Day 19.

2.2.5. CHAMBER OPERATIONS

The nose-only exposure chambers had a total volume of 40 Liters each and were operated dynamically under slight positive pressure at a flow rate of 25.0 Liters per minute (Lpm) for all groups.

The final airflow rate was calculated to provide one complete air change (calculated by dividing the chamber volume by the airflow rate) approximately every 1.6 minutes and a T_{99} equilibrium time (calculated by multiplying the air change by the exponential factor 4.6) of approximately 8 minutes for all 4 groups.

This chamber size and airflow rate was considered adequate to maintain the oxygen level at 19% or higher. At the end of each exposure, all animals remained in the chamber for a minimum of 10 minutes. During this time, each chamber was operated at the same flow rate as used during the exposure. Recordings of chamber airflow rate and static pressure were made at the initiations of the exposures and every half-hour during the exposures.

The chamber was exhausted (via a 1" tubing) through the in-house filtering system, which consisted of a coarse filter, a HEPA filter and an activated charcoal bed. To prevent a static charge from building up, the chamber was grounded.

The nose-only chamber and generation system were enclosed in a 10 m^3 glass and stainless steel chamber. Due to high temperatures, the 10 m^3 chambers were equipped with a portable room air conditioner to maintain proper chamber environments.

Refer to Figures 1 and 2, and Table III for equipment details.

2.2.6. EXPOSURE PROCEDURE

Group 1

House line air was delivered from a regulator and a backpressure gauge, via ¼" tubing to a "Y" tube, which split the airflow into the generation and dilution systems. The generation air (20.0 Lpm) was directed, via ¼" tubing, through a flowmeter, regulated by a metering valve, then into a backpressure gauge connected to the top of a cast aluminum and alloy exposure chamber equipped with polycarbonate nose-only tubes. The dilution air (5.0 Lpm) was directed, via ¼" tubing, to a flowmeter regulated by a metering valve into the dilution port at the top of the chamber.

Groups 2 – 4

After being sieved through a stainless steel sieve, the test substance was packed to 800 psi into dust feeder cups (small diameter) using a press. The cup was then mounted onto the dust feeder, which was controlled using a speed selector. The initial exposure started with the dust feeder at the speed settings listed below:

Group	Speed Setting (rpm)
2	0.100
3	0.290
4	0.950

House line air was delivered from a regulator and a backpressure gauge into the inlet of a gas drying unit, via ¼" tubing to a "Y" tube, which split the airflow into the generation and dilution systems. The generation air (20.0 Lpm) was directed, via ¼" tubing, through a flowmeter, regulated by a metering valve, then into a backpressure gauge connected to a Wright Dust feeder, via ¼" tubing. The test substance was then directed into the inlet of a brass cyclone, via ½" tubing (for Groups 2 and 3 only). The test substance laden air was then directed into the top of a cast aluminum and alloy exposure chamber equipped with polycarbonate nose-only tubes. The dilution air (5.0 Lpm) was

directed, via ¼" tubing, to a flowmeter regulated by a metering valve into the dilution port at the top of the chamber.

Refer to Figures 1 and 2, and Table III for equipment details.

2.3. EXPOSURE CONCENTRATION DETERMINATION

2.3.1. NOMINAL CONCENTRATION

A nominal exposure concentration was calculated daily. The flow of air through the chambers was monitored using appropriate calibrated equipment. The nominal concentrations in mg/m^3 were determined by weighing the generation apparatus containing the test substance before and after the exposure and dividing the difference in these weights by the total volume of air used during the exposure (flowrate multiplied by total exposure time).

Calculation

$$\text{Conc } (mg/m^3) = \frac{\text{amount consumed (g) x 1000 mg/g x 1000 L/m}^3}{\text{exposure duration (min) x airflow (Lpm)}}$$

2.3.2. CHAMBER SAMPLING

Samples for determination of the exposure levels were withdrawn from the breathing zone in the exposure chambers through glass fiber filters mounted open-faced in a filter holder. Samples were withdrawn at least four times per exposure from the normal sampling portal. The filter papers were weighed before and after sample collection, and the gravimetric concentration in mg/m^3 was calculated by dividing the weight difference by the volume of air sampled.

Calculation

$$\text{Conc } (mg/m^3) = \frac{\text{amount collected (mg) x 1000 (L/m}^3)}{\text{sample duration (min) x sample airflow (Lpm)}}$$

The sample flowrates, durations and volumes are summarized below:

Group	Sample Flowrate (Lpm)	Sample Duration (min)	Sample Volume (L)
1	10	30	300
2	10	30	300
3	10	10	100
4	10	3	30

See Table III (Inhalation Report) for equipment list.

2.3.3. PARTICLE SIZE DISTRIBUTION

Group 1

Particle size distribution measurements were performed once during each week of exposure using a TSI Aerodynamic Particle Sizer. The samples were drawn for 20 seconds at a rate of 5.0 Lpm. A computer was used to program the system to the appropriate settings prior to sampling. The particle size distributions were calculated by the computer and printed out. The mass median aerodynamic diameter, geometric standard deviation and total mass concentration were calculated. For comparison, room air samples were similarly collected at least once each week.

See Table III (Inhalation Report) for equipment list.

Groups 2, 3 and 4

Samples for particle size distribution assessment were drawn at least once per chamber during each week of exposure using a cascade impactor. The mass median aerodynamic diameter, the geometric standard deviation and the percent ≤1, 3 and 10 microns were calculated based on the amount of material collected on the six impactor stages (greased stainless steel slides) and a final filter

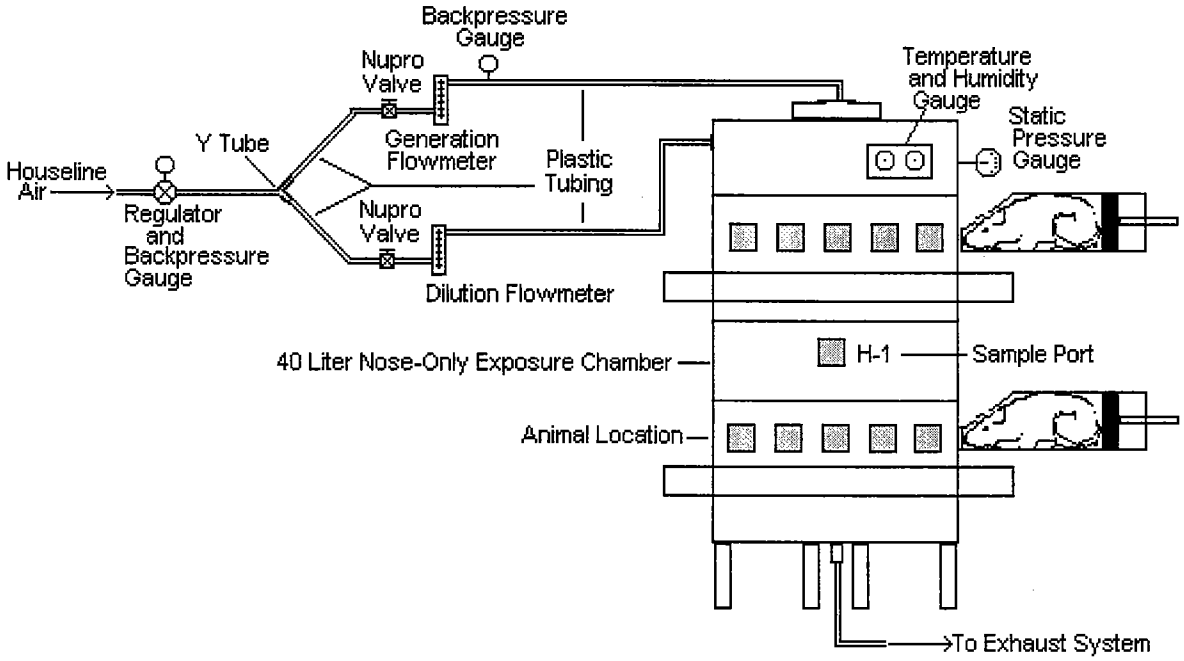
stage using a graphical analysis of an assumed lognormal distribution.

The sample flowrates and durations are summarized below:

Group	Sample Flowrate (Lpm)	Sample Duration (min)	Sample Volume (L)
2	12.6	30	378
3	12.6	10	126
4	12.6	3	37.8

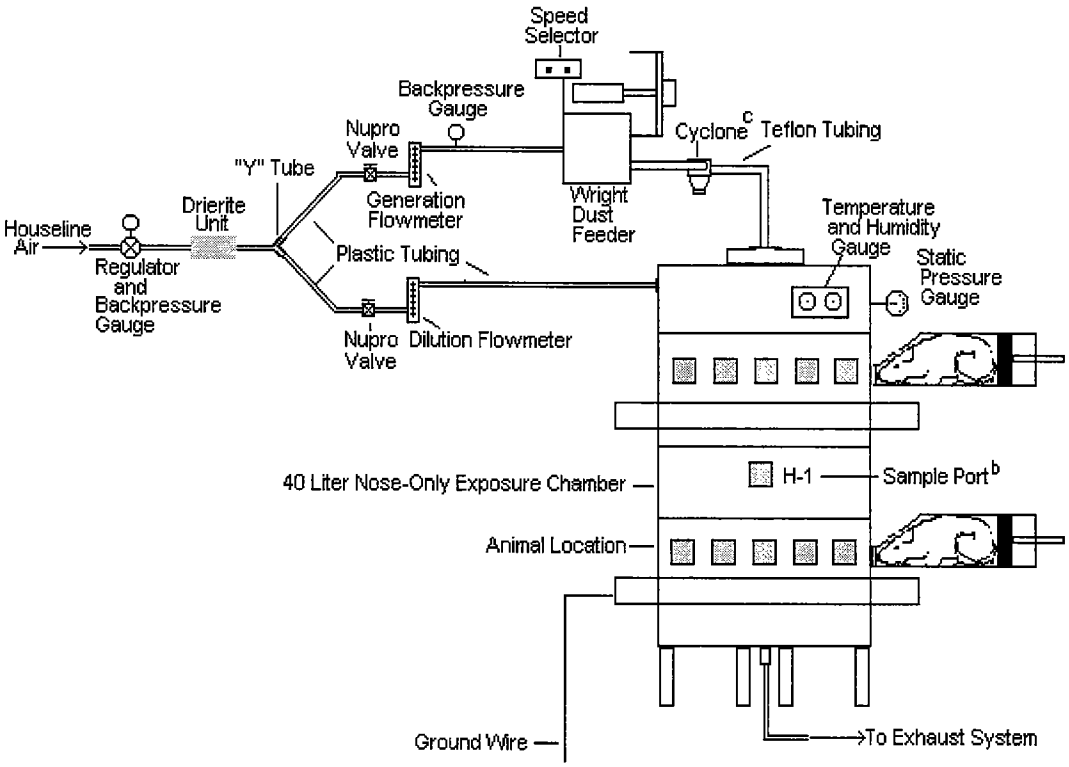
See Table III (Inhalation Report) for equipment list.

Figure 1
Diagram of 40 Liter Nose-Only Exposure
Chamber and Generation System[a]



[a] System enclosed in 10 m^3 glass and stainless steel chamber.

Figure 2
Diagram of 40 Liter Nose-Only Exposure
Chamber and Generation System[a]



[a] System enclosed in 10 m^3 glass and stainless steel chamber.
[b] The distribution sample port H-2 was located on the side opposite the H-1 port. Distribution sample ports H-3 and H-4 were located in a similar configuration relative to the upper animal location.
[c] A cyclone was not used for Group 4.

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Table I
Summary of In-Chamber Observations

Exposure Day	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Group 1 – 0 mg/m^3														
Within Normal Limits	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Group 2 – 30 mg/m^3														
Within Normal Limits	24	24	24	24	24	24	24	24	24	24	24	24	24	24
Group 3 – 100 mg/m^3														
Within Normal Limits	24	24	24	24	24	24	24	24	24	24	21	21	21	20
Black/Test Material on Fur	0	0	0	0	0	0	0	0	0	0	3	3	3	4
Group 4 – 300 mg/m^3														
Within Normal Limits	24	24	24	24	24	24	24	24	24	24	24	24	24	24

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Table I
Summary of In-Chamber Observations

Exposure Day	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**
Group 1 – 0 mg/m^3													
Within Normal Limits	24	24	24	24	24	24	24	24	24	24	24	24	24
Group 2 – 30 mg/m^3													
Within Normal Limits	24	24	24	24	24	24	24	24	24	24	24	24	24
Group 3 – 100 mg/m^3													
Within Normal Limits	20	21	21	21	21	21	21	24	21	21	21	20	21
Black/Test Material on Fur	4	3	3	3	3	3	3	0	3	3	3	4	3
Group 4 – 300 mg/m^3													
Within Normal Limits	24	24	24	21	21	21	21	22	22	22	21	22	21
Black/Test Material on Fur	0	0	0	3	3	3	3	2	2	2	3	2	3

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Table I
Summary of In-Chamber Observations

Exposure Day	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
Group 1 – 0 mg/m^3														
Within Normal Limits	24	24	24	24	12	12	12	12	11	8	5	1	1	1
Group 2 – 30 mg/m^3														
Within Normal Limits	24	24	24	24	12	12	12	12	11	7	2			
Group 3 – 100 mg/m^3														
Within Normal Limits	22	22	22	21	11	10	10	10	9	7	4	0		
Black/Test Material on Fur	2	2	2	3	1	2	2	2	1	1	1	1		
Group 4 – 300 mg/m^3														
Within Normal Limits	23	22	22	21	10	11	11	11	8	3	0	0	0	0
Black/Test Material on Fur	1	2	2	3	2	1	1	1	2	2	2	2	2	2

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Table I
Summary of In-Chamber Observations

Exposure Day	**41**	**42**	**43**	**44**	**45**	**46**	**47**
Group 1 – 0 mg/m^3							
Within Normal Limits	1	1	1	1	1	1	1
Group 4 – 300 mg/m^3							
Within Normal Limits	0	0	0	0	0	0	0
Black/Test Material on Fur	1	1	1	1	1	1	1

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Table II
Chamber Monitoring Results
Preface

Key to Abbreviations

MMAD	=	Mass Median Aerodynamic Diameter
GSD	=	Geometric Standard Deviation
TMC	=	Total Mass Concentration

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Table II

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Chamber Monitoring Results
Cumulative Exposure Record
Group 1 - 0 mg/m^3 (Air only)

Day	Date	Exposure Number	Gravimetric Chamber Concentration						Particle Size Determinations			Chamber Environment	
			Nominal (mg/m^3)	Mean (mg/m^3)	Individual (mg/m^3)				MMAD (µm)	GSD	TMC (mg/m^3)	Mean Temperature (°C)	Mean Humidity (%)
0	25-May-04	1	0	0.00	0.00	0.00	0.00	0.00				20	42
1	26-May-04	2	0	0.00	0.00	0.00	0.00	0.00	4.215	2.148	2.76E-03	20	58
2	27-May-04	3	0	0.00825	0.033	0.00	0.00	0.00				19	64
3	28-May-04	4	0	0.00	0.00	0.00	0.00	0.00				21	54
4	29-May-04	5	0	0.00	0.00	0.00	0.00	0.00				19	48
5	30-May-04	6	0	0.0168	0.067	0.00	0.00	0.00				19	48
6	31-May-04	7	0	0.00	0.00	0.00	0.00	0.00				20	59
7	1-Jun-04	8	0	0.00825	0.00	0.00	0.033	0.00				20	42
8	2-Jun-04	9	0	0.00	0.00	0.00	0.00	0.00	1.759	1.511	7.54E-04	20	47
9	3-Jun-04	10	0	0.00	0.00	0.00	0.00	0.00				19	43
10	4-Jun-04	11	0	0.00	0.00	0.00	0.00	0.00				19	42
11	5-Jun-04	12	0	0.00	0.00	0.00	0.00	0.00				19	44
12	6-Jun-04	13	0	0.00	0.00	0.00	0.00	0.00				18	48
13	7-Jun-04	14	0	0.00	0.00	0.00	0.00	0.00				20	49
14	8-Jun-04	15	0	0.00	0.00	0.00	0.00	0.00				20	48
15	9-Jun-04	16	0	0.00	0.00	0.00	0.00	0.00	0.8269	2.332	2.55E-03	20	47
16	10-Jun-04	17	0	0.00	0.00	0.00	0.00	0.00				20	42
17	11-Jun-04	18	0	0.00	0.00	0.00	0.00	0.00				19	46
18	12-Jun-04	19	0	0.00	0.00	0.00	0.00	0.00				20	43
19	13-Jun-04	20	0	0.00	0.00	0.00	0.00	0.00				20	43
20	14-Jun-04	21	0	0.00	0.00	0.00	0.00	0.00				20	48
21	15-Jun-04	22	0	0.00	0.00	0.00	0.00	0.00				21	47
22	16-Jun-04	23	0	0.00	0.00	0.00	0.00	0.00	1.380	1.703	1.61E-03	20	47
23	17-Jun-04	24	0	0.00	0.00	0.00	0.00	0.00				20	43

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PETROLEUM COKE: REPRODUCTION/DEVELOPMENTAL TOXICITY SCREENING STUDY IN RATS VIA NOSE-ONLY INHALATION EXPOSURES

Chamber Monitoring Results
Cumulative Exposure Record
Group 1 - 0 mg/m^3 (Air only)

Day	Date	Exposure Number	Gravimetric Chamber Concentration						Particle Size Determinations			Chamber Environment	
			Nominal (mg/m^3)	Mean (mg/m^3)	Individual (mg/m^3)				MMAD (µm)	GSD	TMC (mg/m^3)	Mean Temperature (°C)	Mean Humidity (%)
24	18-Jun-04	25	0	0.00	0.00	0.00	0.00	0.00				19	50
25	19-Jun-04	26	0	0.00	0.00	0.00	0.00	0.00				20	54
26	20-Jun-04	27	0	0.00	0.00	0.00	0.00	0.00				20	48
27	21-Jun-04	28	0	0.00	0.00	0.00	0.00	0.00				19	45
28	22-Jun-04	29	0	0.00	0.00	0.00	0.00	0.00				20	55
29	23-Jun-04	30	0	0.00	0.00	0.00	0.00	0.00	1.485	1.817	1.03E-03	20	54
30	24-Jun-04	31	0	0.00	0.00	0.00	0.00	0.00				20	53
31	25-Jun-04	32	0	0.00	0.00	0.00	0.00	0.00				21	40
32	26-Jun-04	33	0	0.00	0.00	0.00	0.00	0.00				20	56
33	27-Jun-04	34	0	0.00	0.00	0.00	0.00	0.00				20	35
34	28-Jun-04	35	0	0.00	0.00	0.00	0.00	0.00				20	37
35	29-Jun-04	36	0	0.00	0.00	0.00	0.00	0.00				20	31
36	30-Jun-04	37	0	0.00	0.00	0.00	0.00	0.00	1.785	1.659	2.23E-03	21	34
37	1-Jul-04	38	0	0.00	0.00	0.00	0.00	0.00				20	31
38	2-Jul-04	39	0	0.00	0.00	0.00	0.00	0.00				20	34
39	3-Jul-04	40	0	0.00	0.00	0.00	0.00	0.00				19	25
40	4-Jul-04	41	0	0.00	0.00	0.00	0.00	0.00				20	46
41	5-Jul-04	42	0	0.00	0.00	0.00	0.00	0.00				20	31
42	6-Jul-04	43	0	0.00	0.00	0.00	0.00	0.00				20	19
43	7-Jul-04	44	0	0.00	0.00	0.00	0.00	0.00	1.612	1.698	1.24E-04	20	36
44	8-Jul-04	45	0	0.00	0.00	0.00	0.00	0.00				21	21
45	9-Jul-04	46	0	0.00	0.00	0.00	0.00	0.00				20	45
46	10-Jul-04	47	0	0.00	0.00	0.00	0.00	0.00				19	45
47	11-Jul-04	48	0	0.00	0.00	0.00	0.00	0.00				20	45
		Mean	**0**		**0.001**				**1.866**	**1.838**	**1.58E-03**	**20**	**44**
		S.D.	**0**		**0.01**				**1.1**	**0.3**	**0.0**	**0.6**	**9.4**

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Chamber Monitoring Results
Cumulative Exposure Record
Group 2 - 30 mg/m^3

Day	Date	Exposure Number	Gravimetric Chamber Concentration						Particle Size Determinations					Chamber Environment	
			Nominal (mg/m^3)	Mean (mg/m^3)	Individual (mg/m^3)				MMAD (µm)	GSD	% of Particles			Mean Temperature (°C)	Mean Humidity (%)
											≤ 1 µm	≤ 3 µm	≤ 10 µm		
0	25-May-04	1	54	22.3	16	21	25	27						22	53
1	26-May-04	2	93	36.0	23	24	58	39	1.694	2.727	29.96	71.55	96.16	21	56
2	27-May-04	3	66	32.0	26	34	33	35						20	58
3	28-May-04	4	61	32.8	33	34	35	29						22	60
4	29-May-04	5	58	30.3	26	29	35	31						20	47
5	30-May-04	6	66	32.5	27	35	34	34						20	47
6	31-May-04	7	61	33.8	30	38	32	35						21	57
7	1-Jun-04	8	46	34.5	36	35	33	34						20	54
8	2-Jun-04	9	58	31.8	30	30	33	34	2.605	3.093	19.91	55.04	88.33	22	53
9	3-Jun-04	10	57	31.0	32	28	32	32						20	57
10	4-Jun-04	11	57	32.0	29	35	31	33						19	53
11	5-Jun-04	12	52	30.3	26	30	34	31						19	49
12	6-Jun-04	13	53	32.0	31	32	32	33						18	58
13	7-Jun-04	14	57	30.0	29	33	29	29						20	63
14	8-Jun-04	15	50	30.3	27	35	29	30						20	64
15	9-Jun-04	16	51	32.0	33	32	33	30	2.225	3.445	25.90	59.55	88.78	21	63
16	10-Jun-04	17	40	29.8	25	34	30	30						21	59
17	11-Jun-04	18	62	29.5	27	28	32	31						20	58
18	12-Jun-04	19	52	31.0	26	35	32	31						20	53
19	13-Jun-04	20	59	29.5	26	28	32	32						21	51
20	14-Jun-04	21	59	32.5	34	32	32	32						22	52
21	15-Jun-04	22	40	31.8	26	36	34	31						23	53
22	16-Jun-04	23	54	30.8	35	32	28	28	1.843	3.101	29.46	66.66	93.25	22	50
23	17-Jun-04	24	56	32.0	27	38	36	27						22	50

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Chamber Monitoring Results
Cumulative Exposure Record
Group 2 - 30 mg/m^3

Day	Date	Exposure Number	Gravimetric Chamber Concentration						Particle Size Determinations					Chamber Environment	
			Nominal (mg/m^3)	Mean (mg/m^3)	Individual (mg/m^3)				MMAD (µm)	GSD	% of Particles			Mean Temperature	Humidity
											≤ 1 µm	≤ 3 µm	≤ 10 µm	(°C)	(%)
24	18-Jun-04	25	54	30.0	32	33	29	26						20	54
25	19-Jun-04	26	63	30.0	32	29	31	28						21	55
26	20-Jun-04	27	37	30.5	29	34	29	30						20	51
27	21-Jun-04	28	51	32.5	28	28	35	39						20	44
28	22-Jun-04	29	54	29.0	27	31	28	30						21	49
29	23-Jun-04	30	53	31.0	31	33	29	31	1.890	2.610	25.35	68.50	95.88	21	49
30	24-Jun-04	31	53	29.3	28	29	29	31						20	49
31	25-Jun-04	32	57	32.5	30	38	32	30						21	52
32	26-Jun-04	33	54	31.0	33	31	32	28						21	50
33	27-Jun-04	34	51	27.0	24	24	24	36						20	40
34	28-Jun-04	35	64	34.3	16	45	40	36						20	46
35	29-Jun-04	36	62	31.8	24	35	32	36						20	49
36	30-Jun-04	37	60	34.5	37	35	31	35	2.922	2.437	11.44	51.18	91.64	21	49
37	1-Jul-04	38	47	30.8	28	30	34	31						21	45
		Mean	**56**		**31.2**				**2.197**	**2.902**	**23.67**	**62.08**	**92.34**	**21**	**53**
		S.D.	**9**		**4.6**				**0.4**	**0.3**	**6.4**	**7.4**	**3.1**	**1.0**	**5.4**

Appendix W

Table II

03-4246

PETROLEUM COKE: REPRODUCTION/DEVELOPMENTAL TOXICITY SCREENING STUDY IN RATS VIA NOSE-ONLY INHALATION EXPOSURES

Chamber Monitoring Results
Cumulative Exposure Record
Group 3 - 100 mg/m^3

Day	Date	Exposure Number	Gravimetric Chamber Concentration						Particle Size Determinations					Chamber Environment	
			Nominal (mg/m^3)	Mean (mg/m^3)	Individual (mg/m^3)				MMAD (µm)	GSD	% of Particles			Mean Temperature	Humidity
											≤ 1 µm	≤ 3 µm	≤ 10 µm	(°C)	(%)
0	25-May-04	1	143	73.0	29	91	79	93						21	54
1	26-May-04	2	160	85.8	26	120	97	100						21	49
2	27-May-04	3	120	93.5	88	83	110	93	2.030	2.907	25.36	64.29	93.25	20	33
3	28-May-04	4	120	106	95	100	110	120						21	33
4	29-May-04	5	120	95.3	71	100	100	110						19	33
5	30-May-04	6	130	107	87	120	120	100						20	33
6	31-May-04	7	120	99.0	81	110	110	95						20	35
7	1-Jun-04	8	130	101	85	110	100	110						20	31
8	2-Jun-04	9	130	101	98	120	100	85						22	30
9	3-Jun-04	10	130	92.0	85	95	94	94	1.785	3.170	30.78	67.37	93.24	20	35
10	4-Jun-04	11	130	100	80	110	110	100						19	32
11	5-Jun-04	12	130	91.0	81	92	98	93						19	32
12	6-Jun-04	13	120	103	93	120	98	100						18	34
13	7-Jun-04	14	120	105	88	120	110	100						20	36
14	8-Jun-04	15	120	91.5	83	98	91	94						20	45
15	9-Jun-04	16	120	108	110	110	100	110						21	40
16	10-Jun-04	17	130	96.5	94	100	98	94	2.057	2.952	25.57	64.45	92.80	20	45
17	11-Jun-04	18	120	105	80	110	110	120						20	40
18	12-Jun-04	19	130	98.0	82	110	100	100						21	39
19	13-Jun-04	20	140	103	100	100	100	110						22	35
20	14-Jun-04	21	140	113	100	130	110	110						21	42
21	15-Jun-04	22	120	99.8	92	100	97	110						22	43
22	16-Jun-04	23	130	105	100	110	110	98						20	44
23	17-Jun-04	24	130	95.0	80	100	100	100	1.797	2.645	27.35	70.09	96.12	20	44

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Table II

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PETROLEUM COKE: REPRODUCTION/DEVELOPMENTAL TOXICITY SCREENING STUDY IN RATS VIA NOSE-ONLY INHALATION EXPOSURES

Chamber Monitoring Results
Cumulative Exposure Record
Group 3 - 100 mg/m^3

Day	Date	Exposure Number	Gravimetric Chamber Concentration						Particle Size Determinations					Chamber Environment	
			Nominal (mg/m^3)	Mean (mg/m^3)	Individual (mg/m^3)				MMAD (µm)	GSD	% of Particles			Mean Temperature	Humidity
											≤ 1 µm	≤ 3 µm	≤ 10 µm	(°C)	(%)
24	18-Jun-04	25	130	110	110	110	120	100						19	47
25	19-Jun-04	26	120	103	100	110	100	100						20	47
26	20-Jun-04	27	130	92.8	82	110	87	92						20	40
27	21-Jun-04	28	140	98.8	80	110	110	95						20	38
28	22-Jun-04	29	130	94.3	82	110	96	89						21	35
29	23-Jun-04	30	150	92.0	80	100	95	93						21	38
30	24-Jun-04	31	140	91.8	81	100	91	95	2.275	2.996	22.69	59.95	91.14	21	42
31	25-Jun-04	32	120	104	98	110	98	110						21	28
32	26-Jun-04	33	130	113	110	120	110	110						21	30
33	27-Jun-04	34	140	98.5	92	110	97	95						20	32
34	28-Jun-04	35	140	94.8	87	96	96	100						20	32
35	29-Jun-04	36	140	115	110	120	120	110						20	33
36	30-Jun-04	37	140	102	88	110	100	110						20	31
37	1-Jul-04	38	130	107	100	120	110	98	2.259	1.934	10.84	66.63	98.79	20	28
38	2-Jul-04	39	140	97.8	99	86	96	110						20	22
		Mean	**131**		**99.4**				**2.034**	**2.767**	**23.77**	**65.46**	**94.22**	**20**	**37**
		S.D.	**10**		**13.9**				**0.2**	**0.4**	**6.3**	**3.1**	**2.5**	**0.9**	**6.8**

Appendix W

Table II

03-4246

PETROLEUM COKE: REPRODUCTION/DEVELOPMENTAL TOXICITY SCREENING STUDY IN RATS VIA NOSE-ONLY INHALATION EXPOSURES

Chamber Monitoring Results
Cumulative Exposure Record
Group 4 - 300 mg/m³

Day	Date	Exposure Number	Gravimetric Chamber Concentration						Particle Size Determinations					Chamber Environment	
			Nominal (mg/m^3)	Mean (mg/m^3)	Individual (mg/m^3)				MMAD (µm)	GSD	% of Particles			Mean Temperature (°C)	Humidity (%)
											≤ 1 µm	≤ 3 µm	≤ 10 µm		
0	25-May-04	1	1200	250	150	280	270	300						21	54
1	26-May-04	2	1300	260	99	280	370	290						21	54
2	27-May-04	3	1300	283	280	280	310	260						20	59
3	28-May-04	4	1200	340	290	360	380	330	2.256	3.009	23.01	60.21	91.18	22	56
4	29-May-04	5	1300	285	260	310	280	290						20	46
5	30-May-04	6	1200	308	280	300	300	350						20	44
6	31-May-04	7	1200	295	290	290	270	330						21	58
7	1-Jun-04	8	970	330	370	340	300	310						20	47
8	2-Jun-04	9	1000	303	300	300	280	330						21	46
9	3-Jun-04	10	800	323	360	290	330	310						20	42
10	4-Jun-04	11	850	270	250	260	290	280	2.722	3.486	21.13	53.10	85.13	20	49
11	5-Jun-04	12	830	295	250	310	310	310						20	51
12	6-Jun-04	13	1000	335	280	320	400	340						19	43
13	7-Jun-04	14	670	300	360	330	260	250						20	44
14	8-Jun-04	15	700	268	280	270	280	240						21	47
15	9-Jun-04	16	780	300	320	260	320	300						21	53
16	10-Jun-04	17	770	308	300	310	320	300						19	53
17	11-Jun-04	18	590	293	260	280	310	320	2.107	2.907	24.29	62.98	92.85	21	49
18	12-Jun-04	19	780	283	250	320	290	270						22	45
19	13-Jun-04	20	820	298	290	320	300	280						22	41
20	14-Jun-04	21	760	300	300	320	280	300						20	55
21	15-Jun-04	22	770	305	310	300	310	300						22	42
22	16-Jun-04	23	790	293	280	300	300	290						21	46
23	17-Jun-04	24	790	300	310	310	280	300						20	49
24	18-Jun-04	25	770	308	300	330	300	300	2.873	2.985	16.72	51.57	87.29	20	48

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Table II

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PETROLEUM COKE: REPRODUCTION/DEVELOPMENTAL TOXICITY SCREENING STUDY IN RATS VIA NOSE-ONLY INHALATION EXPOSURES

Chamber Monitoring Results
Cumulative Exposure Record
Group 4 - 300 mg/m^3

Day	Date	Exposure Number	Gravimetric Chamber Concentration						Particle Size Determinations					Chamber Environment	
			Nominal (mg/m^3)	Mean (mg/m^3)	Individual (mg/m^3)				MMAD (µm)	GSD	% of Particles			Mean Temperature (°C)	Humidity (%)
											≤ 1 µm	≤ 3 µm	≤ 10 µm		
25	19-Jun-04	26	750	305	320	300	310	290						21	48
26	20-Jun-04	27	750	325	300	300	330	370						21	43
27	21-Jun-04	28	830	310	310	290	330	310						20	37
28	22-Jun-04	29	790	308	320	310	300	300						20	40
29	23-Jun-04	30	780	318	310	340	320	300						21	39
30	24-Jun-04	31	790	290	280	290	320	270						20	40
31	25-Jun-04	32	650	335	380	340	310	310	2.775	2.857	16.96	53.32	88.87	20	34
32	26-Jun-04	33	640	308	310	350	310	260						20	38
33	27-Jun-04	34	700	288	270	290	290	300						20	33
34	28-Jun-04	35	670	308	330	320	300	280						20	38
35	29-Jun-04	36	640	303	270	300	330	310						21	34
36	30-Jun-04	37	690	325	310	350	320	320						21	31
37	1-Jul-04	38	660	290	240	330	280	310						20	26
38	2-Jul-04	39	640	310	300	290	330	320	2.939	1.923	4.96	51.25	96.94	20	23
39	3-Jul-04	40	680	348	340	370	350	330						19	20
40	4-Jul-04	41	580	315	350	320	300	290						20	24
41	5-Jul-04	42	610	293	290	250	300	330						21	19
42	6-Jul-04	43	620	308	300	320	300	310						20	19
43	7-Jul-04	44	590	310	310	300	300	330	2.738	2.954	17.62	53.36	88.41	20	23
44	8-Jul-04	45	570	300	300	320	290	290						21	21
45	9-Jul-04	46	580	268	280	230	290	270						21	48
46	10-Jul-04	47	430	278	240	320	290	260						19	49
47	11-Jul-04	48	520	268	220	310	310	230						20	46
		Mean	**798**		**300.7**				**2.630**	**2.874**	**17.81**	**55.11**	**90.10**	**20**	**42**
		S.D.	**218**		**34.7**				**0.3**	**0.5**	**6.4**	**4.6**	**3.9**	**0.8**	**11.0**

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Table III
Equipment List

Exposure Chambers
40 Liter cast aluminum and alloy chamber with Polycarbonate nose-only tubes (ADG Limited, Inc.).

Compound Generator
Wright Dust Feeder, Model Mark II/WDF-II (small diameter cups) with a Wright Dust Feeder Speed Selector, Model E-352-BM (BGI, Inc.).

Flowmeters
Flowmeter, size 0 – 10, 0 – 20, 0 – 30, 0 – 40 Lpm (Dwyer®), calibrated with a Top Trak™ Mass Flowmeter, Model 822-13-OV1 PV1-V1 (Sierra Instruments).

Chamber Static Pressure Gauges
Dwyer® Magnehelic® gauge (Dwyer® Instruments Inc.); calibrated with a Dwyer® Mark II Manometer, Model 25 (Dwyer® Instruments Inc.).

Pressure Gauges
USG backpressure gauge, PN 12672-1.
Norgreen backpressure gauge, PN 9892K23.
Ashcroft backpressure gauge, PN 733-47.
Marshall Town backpressure gauge.

Regulators
Union Carbide, P/N SG 3800 30.
Norgreen, PN 9892K23

Valves
Metering Valve, Model SS-4L Series (Nupro® Co.).

Tubing
Plastic, size ¼", ½", 1" (Norton, Baxter).
Teflon®, size ½".
Y-Tube, plastic.
Stainless Steel, size ½".

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Table III
Equipment List

Filter
Glass fiber filter paper, Type A/E, Size 3.7 cm, Lot No. 32928 (Gelman Sciences Inc.).

Filter holder
Open-faced filter holder (Gelman Sciences Inc.).

Drying Unit
Drierite® Laboratory Gas Drying Unit (W. A. Hammond Drierite® Co.).

Particle Sizer/Analyzer
TSI Aerodynamic Particle Sizer, Model 331001 and a DELL computer, Model 486P/25, equipped with Epson Dot matrix printer, Model P630B.
Delron DCI-6 Cascade Impactor, Serial No. 695 with stainless steel slides, greased with lubricant (Dow-Corning) and a glass fiber filter paper, Type A/E, size 7.6 cm, Lot No. 00830 (Gelman Sciences, Inc.).

Vacuum Pump
Thomas Industries, Inc., Model 707CM50.

Timers
Gralab Universal Timer, Model 171.

Environmental Monitoring
Sunbeam and Springfield Temperature and Humidity Gauge, calibrated with Digital Hygrometer-Thermometer, Model/Part No. 61161-382 (VWR).

Balances
Sartorius LC6200S (Sartorius Corporation).
AND ER-182A.

Miscellaneous
Brass Cyclone #1 (Intox).
Carver Laboratory press model #C, serial # 32000-136.
Stainless Steel Sieve, #60 opening, Fisher Scientific Co.
Portable Room Air Conditioner, Model MPC-09ER (Pelonis).

	Inhalation Report	Appendix W

Table IV
Chamber Distribution Records

Group (target)	Date	Port	Gravimetric Concentration (mg/m^3)	Ratio to H-1
2 (30 mg/m^3)	07 May 2004	H-1	26	1.00
		H-2	25	0.96
		H-1	27	1.00
		H-3	27	1.00
	19 May 2004	H-1	36	1.00
		H-2	35	0.97
		H-1	26	1.00
		H-3	29	1.12
	20 May 2004	H-1	22	1.00
		H-4	24	1.09
	21 May 2004	H-1	33	1.00
		H-3	28	0.85
		H-1	32	1.00
		H-4	32	1.00
3 (100 mg/m^3)	07 May 2004	H-1	84	1.00
		H-2	110	1.31
		H-1	84	1.00
		H-3	84	1.00
		H-1	75	1.00
		H-4	89	1.19
		H-1	79	1.00
		H-2	77	0.97
	19 May 2004	H-1	97	1.00
		H-2	92	0.95
		H-1	110	1.00
		H-3	100	0.91
		H-1	91	1.00
		H-4	92	1.01
4 (300 mg/m^3)	07 May 2004	H-1	190	1.00
		H-2	180	0.95
		H-3	220	1.16
		H-1	210	1.00
		H-4	180	0.86

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Table IV
Chamber Distribution Records

Group (target)	Date	Port	Gravimetric Concentration (mg/m^3)	Ratio to H-1
4 (300 mg/m^3)	19 May 2004			
		H-1	270	1.00
		H-2	270	1.00
		H-1	310	1.00
		H-3	240	0.77
	20 May 2004			
		H-1	300	1.00
		H-3	290	0.97
		H-1	260	1.00
		H-4	250	0.96
	21 May 2004			
		H-1	310	1.00
		H-2	330	1.06
		H-1	290	1.00
		H-3	280	0.97
		H-1	290	1.00
		H-4	320	1.10

	Range-Finding Study Report	Appendix X

STUDY NO. 03-6147

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

Final Report

Author: [redacted]

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

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

Attn: [redacted]

Date: 3 April 2009

STATEMENT OF COMPLIANCE

This study was conducted in compliance with the United States Environmental Protection Agency's (EPA) Good Laboratory Practice Standards 40 CFR Part 792 (TSCA) and the Organization for Economic Cooperation and Development (OECD) Good Laboratory Practices as set forth in ENV/MC/CHEM/(98)17, with the following exception:

The Supplier was responsible for the characterization and stability of the test substance and those tests were not performed at a GLP compliant laboratory nor were conducted under GLP regulations.

[redacted]

3 APR 09
Date

[redacted]

3/20/2009
Date

SIGNATURE PAGE

SCIENTIST

The following Scientists were responsible for the overall conduct of this study. Departmental supervisory personnel are listed on the personnel page of this report (Appendix M).

[redacted]

2 APR 09
Date

2 Apr 09.
Date

SCIENTIFIC REVIEW

The following Scientist has reviewed and approved this report:

[redacted]

2 APR 09
Date

[1] Wanda B. High was the Study Pathologist for this study and for submission of the draft report and is no longer employed at the Testing Facility. Dianne Creasy is assuming responsibility for finalization of the pathology evaluation of this report.

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

QUALITY ASSURANCE STATEMENT

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

Type of Inspection	Date(s) of Inspection	Reported to Study Director and Management
GLP Protocol Review	16 Feb 04	16 Feb 04
Exposure, Monitoring & Equipment Records	3 Mar 04	9 Mar 04
Body Weight Data Collection	9 Mar 04	9 Mar 04
Detailed Physical Observations Data Collection & Protocol Amendment No. 1	10 Mar 04	15 Mar 04
Terminal Necropsy & Training Records	16 Mar 04	19 Mar 04
Final Report & Study Data	24 May – 2 Jun 04	2 Jun 04
Final Report Review & Protocol Amendment No. 2	29 & 30 Oct 08	30 Oct 08

[redacted]

3 Apr 09
Date

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

SUMMARY

This study was designed to provide a preliminary assessment of the toxicity of petroleum coke when administered, as a dust, via nose-only inhalation to rats for 2 weeks in order to determine exposure levels for a subsequent OECD 421 reproductive/developmental toxicity screening study. Male and female Sprague-Dawley CD® rats (10/sex/group) were exposed for 6 hours/day, 7 days/week for 2 weeks to 0 (Air only), 25, 75 or 200 mg/m^3 of petroleum coke. At the end of the treatment period, all animals were euthanized and necropsied. The following parameters were evaluated: viability, clinical observations, body weights, feed consumption, organ weights and macroscopic observations. Histopathological evaluation of the lungs was conducted on all animals. Exposure levels were determined using a gravimetric sampling procedure 4 times per chamber per day. Particle size distribution measurements were also made once per chamber per day.

The mean (± standard deviation) exposure concentrations of petroleum coke were determined to be 23.8 ± 5.2, 68.6 ± 14.5 and 199 ± 35 mg/m^3 for the three test substance exposed groups, respectively. The average mass median diameter was determined to be 2.064 µm with an average geometric standard deviation of 2.670 indicating that the particles for the test substance exposed groups were highly respirable to the test animals. All animals survived to termination and were unremarkable during the exposure periods and the non-exposure periods. There were no exposure-related differences in body weights or in feed consumption in the test substance exposed animals, compared to the air control animals. There were exposure-related increases in lung weights (absolute and relative to body weight or brain weight) in the test substance exposed male animals (all groups) and female animals (high exposure level), compared to the Air Control animals. Lungs from all test substance exposed animals were slightly to severely discolored black. In addition, there was an exposure level related incidence of discoloration and enlargement of the mediastinal lymph nodes. Microscopically, test substance related pulmonary changes were present in all exposure groups examined. The changes were characterized by the presence of histiocytes containing black pigment within the alveoli and hyperplasia/hypertrophy of the bronchiolo-alveolar epithelium.

In conclusion, two weeks of exposure of rats to petroleum coke at exposure levels of 25, 75 and 200 mg/m^3 resulted in discolored lungs, increased lung weights, the presence of histiocytes containing black pigment within the alveoli and slight hyperplasia/hypertrophy of the bronchiolar epithelium. Based on increased lung weights, the portal of entry LOAEL for males was 25 mg/m^3 and the NOAEL for females was 75 mg/m^3. There were no systemic effects observed, consequently the systemic NOAEL for both males and females was 200 mg/m^3. Consequently, higher exposure levels of 30, 100 and 300 mg/m^3 were selected for the definitive OECD 421 screening study 04-4246 to maximize the likelihood of systemic effects at the highest exposure level.

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1. INTRODUCTION

The purpose of this study was designed to provide a preliminary assessment of the toxicity of petroleum coke when administered as a dust via nose-only inhalation to rats for 6 hours/day for 7 days per week for 2 weeks, in order to determine exposure levels for a subsequent OECD 421 reproductive/developmental toxicity screening study.

2. MATERIALS AND METHODS

2.1. STUDY MANAGEMENT

2.1.1. SPONSOR

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

2.1.2. SPONSOR REPRESENTATIVE

[redacted]

2.1.3. TESTING FACILITY

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

2.1.4. STUDY DIRECTOR

[redacted]

2.2. STUDY DATES

2.2.1. STUDY INITIATION

17 February 2004 (Date Study Director signed the Protocol)

2.2.2. DATE OF ANIMAL RECEIPT

17 February 2004 (Experimental Start Date, per OECD GLP's)

2.2.3. INITIATION OF EXPOSURES

2 March 2004 - Males (Experimental Start Date, per EPA GLP's)
3 March 2004 - Females

2.2.4. TERMINATION OF EXPOSURES

15 March 2004 - Males
16 March 2004 - Females

2.2.5. TERMINAL SACRIFICE

16 March 2004 - Males
17 March 2004 - Females

2.2.6. EXPERIMENTAL TERMINATION

2 April 2009 (Date of last data collection = Date final report is signed by the Pathologist)

2.2.7. STUDY COMPLETION

3 April 2009 (Date Study Director signed the Final Report)

2.3. EXPERIMENTAL OUTLINE

Group	Group Designation	Exposure Level[a]	Number of Animals			
			Initial		Necropsy	
		mg/m^3	M	F	M	F
1	Air Control	0	10	10	10	10
2	Low	25	10	10	10	10
3	Mid	75	10	10	10	10
4	High	200	10	10	10	10

[a]Exposures were 6 hours per day for 7 consecutive days per week for 2 weeks for a total of 14 exposures. Exposure levels were expressed as mg/m^3 of test substance. The exposures were conducted via nose-only exposure because this regimen minimized the dermal deposition and possible oral absorption of the test substance.

M = male; F = female
The first day of exposure was defined as Day 0 of the study.

2.4. JUSTIFICATIONS

2.4.1. ROUTE, DURATION AND FREQUENCY

The inhalation route is one of the potential routes of human exposure to this test substance. The duration of the study and frequency of exposures were considered the minimum necessary for determining the exposure levels for a subsequent OECD 421 study.

2.4.2. TEST ANIMAL SELECTION

The rat is a rodent animal model commonly utilized in toxicity studies, as recommended in OECD and EPA guidelines. In addition, a historical database is available for comparative evaluation.

2.4.3. NUMBER OF ANIMALS

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

2.4.4. EXPOSURE LEVEL SELECTION

The exposure levels were selected, based on prior results (HLS study 97-6119) of pulmonary toxicity after 5 days of exposure at exposure levels greater than 50 mg/m^3, in order to determine exposure levels for a subsequent OECD 421 Study 03-4246. Based on a subsequent re-review, it was decided that the initial high exposure level of 50 mg/m^3 was not high enough to sufficiently assess a maximum tolerated exposure level. Therefore, the high exposure level was increased to 200 mg/m^3 (expected to result in marked pulmonary toxicity and body weight effects). This resulted in an essentially 12 times higher exposure than the prior 5 days study since the exposure level increased by a factor of 4 (from 50 to 200 mg/m^3) and the duration of the exposures increased by a factor of 3 (from 5 to 14 days). The lower exposures levels were also proportionately adjusted.

2.5. TEST SUBSTANCE

Petroleum Coke

2.5.1. TEST SUBSTANCE CATEGORY

Residual product from petroleum refining.

2.5.2. SUPPLIER

EPL Archives, Inc.
45610 Terminal Drive
Sterling, VA 20166

2.5.3. LOT NUMBER

M05369A

2.5.4. PURITY

See Appendix L (COA)

2.5.5. DESCRIPTION

Black powder

2.5.6. DATE RECEIVED

22 October 2003

2.5.7. EXPIRATION DATE

Not available, but stable as per COAs (see Appendix Y in 03-4246).

2.5.8. ANALYSIS

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

2.5.9. STORAGE

Room temperature (ambient)

2.5.10. ARCHIVAL SAMPLE

A sample from the lot of the test substance was taken and stored in the archives of the sponsor (EPL Archives, Inc., 45610 Terminal Drive, Sterling, Virginia 20166) on 21 June 2004. A common archival sample was taken for this range-finding study and the subsequent OECD 421 study (HLS Study No. 03-4246).

2.5.11. DISPOSITION

The unused portion of the test substance and any empty test substance containers will be returned to the archives of the sponsor following submission of the final report of the final study with this test substance.

2.6. TEST ANIMALS

2.6.1. SPECIES

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

2.6.2. SUPPLIER

Charles River Laboratories
Kingston, New York 12484

2.6.3. NUMBER OF ANIMALS

Received:
88 total (44 males, 44 females)

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

Females were nulliparous and non-pregnant.

2.6.4. AGE AT RECEIPT

Approximately 6 weeks

2.6.5. AGE AT INITIATION OF EXPOSURES

Approximately 8 weeks

2.6.6. WEIGHT AT INITIATION OF EXPOSURES (GRAMS)

	Mean	Range
Male:	265	247 - 287
Female:	209	183 - 225

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

2.6.7. ACCLIMATION PERIOD

Animals were acclimated for approximately 2 weeks. All animals were examined during the acclimation period to confirm suitability for study.

2.7. ANIMAL ASSIGNMENT

More animals than required for the study were purchased and acclimated. Animals considered unsuitable for the study on the basis of pretest physical examinations or outlying body weight data were eliminated prior to random selection for group assignment. Animals considered suitable for study were distributed into 4 groups of 10 animals per sex by a computerized random sort program so that body weight means for each group were comparable. Disposition of all animals not utilized in the study is maintained in the study file.

2.8. ANIMAL IDENTIFICATION

Each rat was identified with a tail tattoo bearing its assigned animal number. The assigned animal number plus the study number comprised the unique animal number for each animal. In addition, each cage was provided with a cage card that was color-coded for exposure level identification and contained animal number information.

2.9. VETERINARY CARE

Animals were monitored by the technical staff for any conditions requiring possible veterinary care.

2.10. HUSBANDRY DURING NON-EXPOSURE PERIODS

2.10.1. FACILITIES MANAGEMENT/ANIMAL HUSBANDRY

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

2.10.2. HOUSING

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

2.10.3. FEED

Certified Rodent Diet, No. 5002 (Meal) (PMI Nutrition International, St. Louis, Missouri) was available without restriction. Fresh feed was presented weekly.

2.10.4. FEED ANALYSIS

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

2.10.5. WATER

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

2.10.6. WATER ANALYSIS

Water analyses are conducted by Elizabethtown Water Company, Westfield, New Jersey (Raritan-Millstone Plant) to ensure that water meets standards specified under the EPA Federal Safe Drinking Water Act Regulations (40 CFR Part 141). In addition, water samples are collected biannually from representative rooms in the testing facility; chemical and microbiological water analyses

are conducted on these samples by a subcontract laboratory. Results of all water analyses are maintained on file at the testing facility. There were no known contaminants in the water, which were expected to interfere with the results of this study.

2.10.7. ENVIRONMENTAL CONDITIONS

Light/Dark Cycle

Twelve hour light/dark cycle controlled via an automatic timer.

Temperature

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

Desired Range:	18 to 26°C
Actual Range:	21.0 to 24.6°C
Daily Average Range:	21.1 to 22.7°C

Relative Humidity

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

Desired Range:	30 to 70%
Actual Range:	38.99 to 65.46%
Daily Average Range:	45.58 to 59.96%

2.11. HUSBANDRY DURING EXPOSURE PERIODS

2.11.1. HOUSING

Animals were individually housed in polycarbonate tubes attached to a cast aluminum and alloy 40 Liter nose-only exposure chamber. The placement of the animal in the nose-only exposure cone was rotated at each exposure to ensure uniform exposure of the animals. A description of the animal rotation is included in the raw data.

2.11.2. FEED

None was provided during exposure.

2.11.3. WATER

None was provided during exposure.

2.11.4. ENVIRONMENTAL CONDITIONS

Chamber temperature and relative humidity were recorded every half-hour during exposure and maintained, to the maximum extent possible, within the ranges presented below. Excursions outside the specified ranges were not considered to have affected the integrity of the study.

Temperature

Desired Range:	20 to 24°C
Actual Range:	19 to 23°C

Relative Humidity

Desired Range:	40 to 60%
Actual Range:	11 to 46%

2.12. TEST SUBSTANCE ADMINISTRATION AND CHAMBER OPERATION

2.12.1. ROUTE OF ADMINISTRATION

Inhalation, as a dust, via nose-only exposures.

2.12.2. EXPOSURE LEVELS

Group 1 - 0 mg/m^3
Group 2 - 25 mg/m^3
Group 3 - 75 mg/m^3
Group 4 - 200 mg/m^3

2.12.3. FREQUENCY AND DURATION ADMINISTRATION

The test substance was administered for 6 hours per day for 7 consecutive days per week for 2 weeks. Test substance administration continued through the day prior to necropsy.

2.12.4. ADMINISTRATION OF TEST SUBSTANCE

The test substance was administered as a dust in the breathing air of the animals.

2.12.5. PRE-STUDY TRIALS

Trials were performed (at least one 6-hour period) to evaluate the optimal set of conditions and equipment to generate a stable and uniform atmosphere at the targeted exposure levels with a mass median aerodynamic diameter of 1.0 – 3.0 microns. Prior to initiation of animal exposures, additional samples were taken to determine the distribution of the test substance in the exposure chamber.

2.12.6. CHAMBER OPERATION

The nose-only exposure chambers had a total volume of 40 Liters each and were operated dynamically under slight positive pressure at a flow rate of 25.0 Liters per minute (Lpm) for all groups.

The final airflow rate was calculated to provide one complete air change (calculated by dividing the chamber volume by the airflow rate) approximately every 1.6 minutes and a T_{99} equilibrium time (calculated by multiplying the air change by the exponential factor 4.6) of 7.4 minutes for all 4 groups.

This chamber size and airflow rate were considered adequate to maintain the oxygen level at 19% or higher. At the end of each exposure, all animals remained in the chamber for a minimum of 30 minutes. During this time, each chamber was operated at the same flow rate as used during the exposure. Recordings of chamber airflow rate and static pressure were made at the initiations of the exposures and every half-hour during the exposures.

The chamber was exhausted (via a 1" tubing) through the in-house filtering system, which consisted of a coarse filter, a HEPA filter and an activated charcoal bed.

Refer to Figure 1 and Appendix I for equipment details.

2.12.7. EXPOSURE PROCEDURE

Group 1

House line air was delivered from a regulator and a backpressure gauge, via ¼" tubing to a "Y" tube, which split the airflow into the generation and dilution systems. The generation air (20.0 Lpm) was directed, via ¼" tubing, through a flowmeter, regulated by a metering valve, then into a backpressure gauge to the top of a cast aluminum and alloy exposure chamber equipped with polycarbonate nose-only tubes. The dilution air (5.0 Lpm) was directed, via ¼" tubing, to a flowmeter regulated by a metering valve into the dilution port at the top of the chamber.

The exposure chamber and generation system were enclosed in a 10 m^3 glass and stainless steel chamber.

Groups 2, 3 and 4

After being sieved through a stainless steel sieve, the test substance was packed to 700 psi into dust feeder cups (small diameter) using a press. The cup was then mounted onto the dust feeder, which was controlled using a speed selector. The exposure started with the dust feeder at the speed settings listed below:

Group	Speed Setting (rpm)
2	0.110
3	0.290
4	0.427

House-line air was delivered from a regulator and a backpressure gauge to the inlet of a gas drying unit via ¼" tubing. From the drying unit, the air was directed to a "Y" tube, which split the airflow into the generation and dilution systems. The generation

air flowed through ¼" tubing into the inlet of a flowmeter, regulated by a metering valve, then into a backpressure gauge. From the backpressure gauge, the air (20.0 Lpm) flowed through ¼" tubing to the inlet of the dust feeder. The test substance laden air was directed, via ½" tubing into the inlet of a brass cyclone (Groups 2 and 3 only, a cyclone was not used for Group 4) to remove the largest particles. The test substance laden air was then directed into the top of the 40 Liter cast aluminum and alloy exposure chamber equipped with polycarbonate nose-only tubes. The dilution air (5.0 Lpm) was directed via ¼" tubing to a flowmeter regulated by a metering valve into the dilution port at the top of the chamber.

The exposure chamber and generation system were enclosed in a 10 m^3 glass and stainless steel chamber.

Refer to Figure 1 and Appendix I for equipment details.

2.13. EXPOSURE CHAMBER SAMPLING

2.13.1. CHAMBER SAMPLING

Samples for determination of the exposure levels were withdrawn from the breathing zone in the exposure chambers through glass fiber filters mounted open-faced in a filter holder. Samples were withdrawn at least four times per exposure from the normal sampling portal. The filter papers were weighed before and after sample collection, and the gravimetric concentration in mg/m^3 was calculated by dividing the weight difference by the volume of air sampled.

Calculation

$$\text{Conc } (mg/m^3) = \frac{\text{amount collected (mg) x 1000 } (L/m^3)}{\text{sample duration (min) x sample airflow (Lpm)}}$$

The sample flowrates, durations and volumes are summarized below:

Group	Sample Flowrate (Lpm)	Sample Duration (min)	Sample Volume (L)
1	10	30	300
2	10	30	300
3	10	10	100
4	10	3	30

Refer to Appendix I for equipment details.

2.13.2. PARTICLE SIZE DISTRIBUTION ANALYSIS

Group 1

Particle size distribution measurements were performed once during each exposure using a TSI Aerodynamic Particle Sizer. The samples were drawn for 20 seconds at a rate of 5.0 Lpm. A computer was used to program the system to the appropriate settings prior to sampling. The particle size distributions were calculated by the computer and printed out. The mass median aerodynamic diameter, geometric standard deviation and total mass concentration were calculated. For comparison, room air samples were similarly collected at least once each exposure day.

Refer to Appendix I for equipment details.

Groups 2, 3 and 4

Samples for particle size distribution assessment were drawn at least once per chamber during each exposure using a cascade impactor. The mass median aerodynamic diameter, the geometric standard deviation and the percent ≤1, 3 and 10 microns were calculated based on the amount of material collected on the six impactor stages (greased stainless steel slides) and a final filter stage using a graphical analysis of an assumed lognormal distribution.

The sample flowrates and durations are summarized below:

Group	Sample Flowrate (Lpm)	Sample Duration (min)	Sample Volume (L)
2	12.6	25	315
3	12.6	8	100.8
4	12.6	3	37.8

Refer to Appendix I for equipment details.

2.13.3. NOMINAL CONCENTRATION

The nominal concentrations in mg/m^3 were determined by weighing the generation apparatus containing the test substance before and after the exposure and dividing the difference in these weights by the total volume of air used during the exposure (flowrate multiplied by total exposure time).

Calculation

$$\text{Conc } (mg/m^3) = \frac{\text{amount consumed (g) x 1000 mg/g x 1000 L/m}^3}{\text{exposure duration (min) x airflow (Lpm)}}$$

2.14. EXPERIMENTAL EVALUATIONS

2.14.1. VIABILITY CHECKS

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

2.14.2. PHYSICAL EXAMINATIONS

Exposure Observations

All animals were observed as a group once during each exposure. This was routinely done near the middle of each exposure.

Detailed Physical Examination

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

2.14.3. BODY WEIGHT

Animals were removed from their cages and weighed twice pretest and once per week during the study period. Fasted weights were obtained prior to necropsy.

2.14.4. FEED CONSUMPTION

Feed was available without restriction 7 days/week. Animals were presented with weighed feeders (weight included feed, jar and lid). After 7 or 6 days, feeders were reweighed and the resulting weight was subtracted from the full feeder weight to obtain the grams consumed per animal over the 7 or 6-day period. Feed consumption was measured (weighed) during the week prior to treatment initiation and weekly during the study period.

Calculation

$$\text{Feed Consumption (g/kg/day)} = \frac{\text{grams of feed consumed}}{\text{body weight (kg)}^a} \div 7 \text{ or } 6 \text{ days}$$

[a]Average of current and prior measurement

2.15. POSTMORTEM

2.15.1. NECROPSY INFORMATION

Necropsy was performed on all animals after they had been treated for 14 days. Animals were fasted overnight prior to necropsy. A

necropsy schedule was established to ensure that approximately equal numbers of males and females from each group were examined at similar times of day throughout the necropsy period.

Method of Euthanasia

Exsanguination following carbon dioxide inhalation.

2.15.2. MACROSCOPIC EXAMINATIONS

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

2.15.3. ORGAN WEIGHTS

Organs indicated in Table I (page 560) were weighed for all animals at the scheduled sacrifice interval. Prior to weighing, the organs were carefully dissected and properly trimmed to remove fat and other contiguous tissues in a uniform manner. Organs were weighed as soon as possible after dissection in order to avoid drying. Paired organs were weighed together.

2.15.4. TISSUES PRESERVED AND EXAMINED HISTOLOGICALLY

The tissues listed in Table I (page 560) were obtained at necropsy for all animals. Slides of the lungs were prepared and examined microscopically for all animals.

TABLE I

ORGAN NAME	WEIGHED	PRESERVED	EXAMINED MICROSCOPICALLY All Animals
Adrenal glands	X	X	
Aorta (thoracic)		X	
Bone (sternum/femur)		X	
Bone marrow (rib)[a]		X	
Brain (medulla/pons, cerebrum and cerebellum)	X	X	
Epididymides	X	X	
Esophagus		X	
Eye (with optic nerve)		X	
Heart	X	X	
Kidneys	X	X	
Lacrimal glands		X	
Large intestine (cecum, colon, rectum)		X	
Larynx		X	
Liver	X	X	
Lungs (with mainstem bronchi)	X	X	X
Lymph nodes (mesenteric and mediastinal)		X	
Mammary gland		X	
Muscle (biceps femoris)		X	
Nasopharyngeal tissue		X	
Nerve (sciatic)		X	
Ovaries	X	X	
Pancreas		X	
Pituitary gland	X	X	
Salivary glands with submandibular lymph nodes		X	
Seminal vesicles (with prostate gland)	X	X	
Skin		X	

ORGAN NAME	WEIGHED	PRESERVED	EXAMINED MICROSCOPICALLY All Animals
Small intestine (duodenum, ileum, jejunum)		X	
Spinal cord (cervical, thoracic, lumbar)		X	
Spleen	X	X	
Stomach		X	
Testes	X	X	
Thymus	X	X	
Thyroid (with parathyroid)		X	
Trachea		X	
Urinary bladder		X	
Uterus (body/horns) with cervix	X	X	
Zymbal's gland		X	
Gross lesions and tissue masses		X	

[a]Bone marrow smears were prepared and archived without examination.

Preservatives

All tissues - 10% neutral buffered formalin.
Eyes and testes and epididymides were placed in Modified Davidson's solution initially and then retained in 10% formalin. Lungs (gravity method) and urinary bladder were infused with formalin prior to their immersion into a larger volume of the same fixative.

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

Processing

After fixation, the lungs from all animals were routinely processed, embedded in paraffin, cut at a microtome setting of 4-7 microns, mounted on glass slides, stained with hematoxylin and eosin and examined by light microscopy.

2.16. STATISTICAL ANALYSIS

The following parameters were analyzed statistically:

mean body weight values
mean feed consumption values
mean terminal organ weight, mean organ/body and mean organ/brain weight ratios

2.16.1. METHOD OF ANALYSIS

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

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

2.17. DATA STORAGE

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

2.18. REGULATORY REFERENCES

2.18.1. TEST GUIDELINES

This study was not designed to meet or exceed any regulatory requirements. It was designed to assess the toxicity of the test substance in order to determine exposure levels for a subsequent OECD 421 reproductive/developmental toxicity screening study.

2.18.2. GOOD LABORATORY PRACTICES

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

2.18.3. ANIMAL WELFARE ACT COMPLIANCE

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

2.19. PROTOCOL DEVIATION

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

1. Groups 2 and 3 had only one 6-hour trial period (rather than at least two trial periods) for exposure levels of 25 and 75 mg/m^3.

3. RESULTS AND DISCUSSION

3.1. CHAMBER MONITORING

(Appendices A and J)

Prestudy chamber distribution analyses showed the test substance was evenly distributed within each chamber.

The target and mean gravimetric and nominal concentrations are summarized as follows:

Group	Target Concentration (mg/m^3)	Gravimetric Concentration (mg/m^3)	Nominal Concentration (mg/m^3)
1	0	0 ± 0	-
2	25	23.8 ± 5.2	24 ± 7
3	75	68.6 ± 14.5	136 ± 27
4	200	199 ± 35	563 ± 45

The achieved mean gravimetric exposure concentration for the test substance groups were acceptably close (within ± 30 or 40%) in the opinion of the study director to the target concentrations. The differences between measured and nominal concentrations were typical for this type of dust exposure and considered to represent deposition of test substance on surfaces within the exposure chambers.

Chamber environmental conditions averaged 21°C temperature and 27% relative humidity.

Particle size distribution measurements for the test substance exposures are summarized as follows:

Group	Mass Median Aerodynamic Diameter (µm)	Geometric Standard Deviation	% of Particles		
			≤ 1.0 µm	≤ 3.0 µm	≤ 10 µm
2	1.586	2.706	33.09	74.81	96.40
3	2.174	2.650	21.95	64.27	93.87
4	2.432	2.654	18.61	58.91	92.59
Mean	2.064	2.670	24.55	66.00	94.29

These results indicated that the particles for the test substance exposed groups were highly respirable to the test animals.

3.2. MORTALITY

(Appendix B)

All animals survived to termination.

3.3. CLINICAL OBSERVATIONS

3.3.1. IN-CHAMBER OBSERVATIONS

(Table 1)

The test animals were unremarkable during the exposure periods.

3.3.2. DETAILED OBSERVATIONS

(Table 2, Appendix C)

The test animals were generally unremarkable during the non-exposure periods. Scattered observations such as chromodacryorrhea and red nasal discharge were noted but were not attributed to treatment. Black test substance on fur was also frequently noted in the test substance exposed groups but this was considered an artifact of the exposure regime.

3.4. BODY WEIGHTS

(Figures 2 and 3, Tables 3 and 4, Appendices D and E)

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

3.5. FEED CONSUMPTION

(Figures 4 and 5, Table 5, Appendix F)

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

3.6. ORGAN WEIGHTS

(Table 6, Appendix G)

There were exposure-related increases (up to 17%) in lung weights (absolute and relative to body weight or brain weight) in the test substance exposed male animals (all groups) compared to the Air Control animals. Similar increases (up to 15%) were seen in the exposed female animals only at the high exposure level. A number of statistically significant increases were noted in pituitary weights (absolute and/or relative to body weight or brain weight) in the test substance exposed male animals (all groups) and female animals (low exposure group) compared to the Air Control animals. However, in the absence of any corresponding macroscopic postmortem findings or meaningful relationship to exposure, these differences were not attributed to the exposures. A statistically significant decrease was noted in ovary weights (absolute) in the test substance exposed female animals (middle exposure group) compared to the Air Control animals. However, in the absence of an exposure level related pattern, this difference also was not attributed to the exposures.

3.7. PATHOLOGY

3.7.1. MACROSCOPIC OBSERVATIONS

(Table 7, Appendix H)

Lungs from all test substance exposed animals were slightly to severely discolored black. The severity of the finding showed an

exposure level related trend. In addition, there was an exposure level related incidence of discoloration and enlargement of the mediastinal lymph nodes.

3.7.2. MICROSCOPIC OBSERVATIONS

(Table 8, Appendix H)

Slight to moderate brown-black pigment deposits were present in the lungs of animals from all test substance exposed groups. The severity showed an exposure related increase. The pigment was generally present in alveolar macrophages, which were located within the alveolar lumens but could often be found within the bronchial associated lymphoid tissue. This indicates that the lymphatics are a route for clearance of the pigment containing macrophages. An exposure related increase was also seen in the numbers of alveolar/intraalveolar macrophages in all test substance exposed groups. Slight hyperplasia/hypertrophy of the bronchiolar epithelium was present in 8/10 of the males and 4/10 of the females from the high exposure group. Slight to moderate hyperplasia/hypertrophy of the alveolar duct/alveolar epithelium was present in animals from all test substance exposed groups and the severity showed an exposure related trend. The findings were not equally distributed in all 5-6 lobes of the lung. In most cases, 1-2 lobes were more affected than the others. The findings recorded reflect the worst affected lobes.

Overall, test substance related pulmonary changes were present in all exposure groups examined. The changes were characterized by the presence of histiocytes containing black pigment within the alveoli and hyperplasia/hypertrophy of the bronchiolo-alveolar epithelium. The severity of these changes was exposure level related. On the basis that there was a general lack of inflammatory response to the inhaled particles and that only a proportion of the lobes of each lung were affected, pulmonary function was probably not significantly compromised.

4. CONCLUSION

Two weeks of exposure of rats to petroleum coke at exposure levels of 25, 75 and 200 mg/m^3 resulted in discolored lungs, increased lung weights, the presence of histiocytes containing black pigment within the alveoli and slight hyperplasia/hypertrophy of the bronchiolar epithelium. Based on increased lung weights, the portal of entry LOAEL for males was 25 mg/m^3 and the NOAEL for females was 75 mg/m^3. There were no systemic effects observed, consequently the systemic NOAEL for both males and females was 200 mg/m^3. Consequently, higher exposure levels of 30, 100 and 300 mg/m^3 were selected for the definitive OECD 421 screening study 04-4246 to maximize the likelihood of systemic effects at the highest exposure level.

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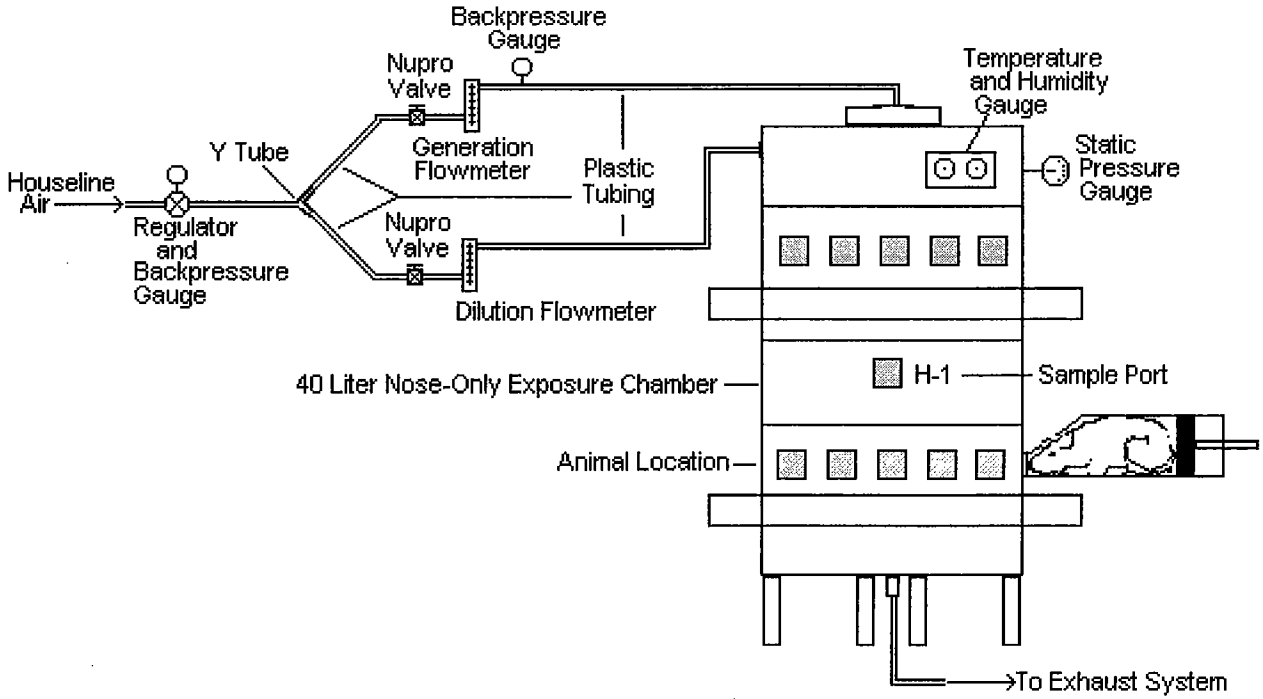
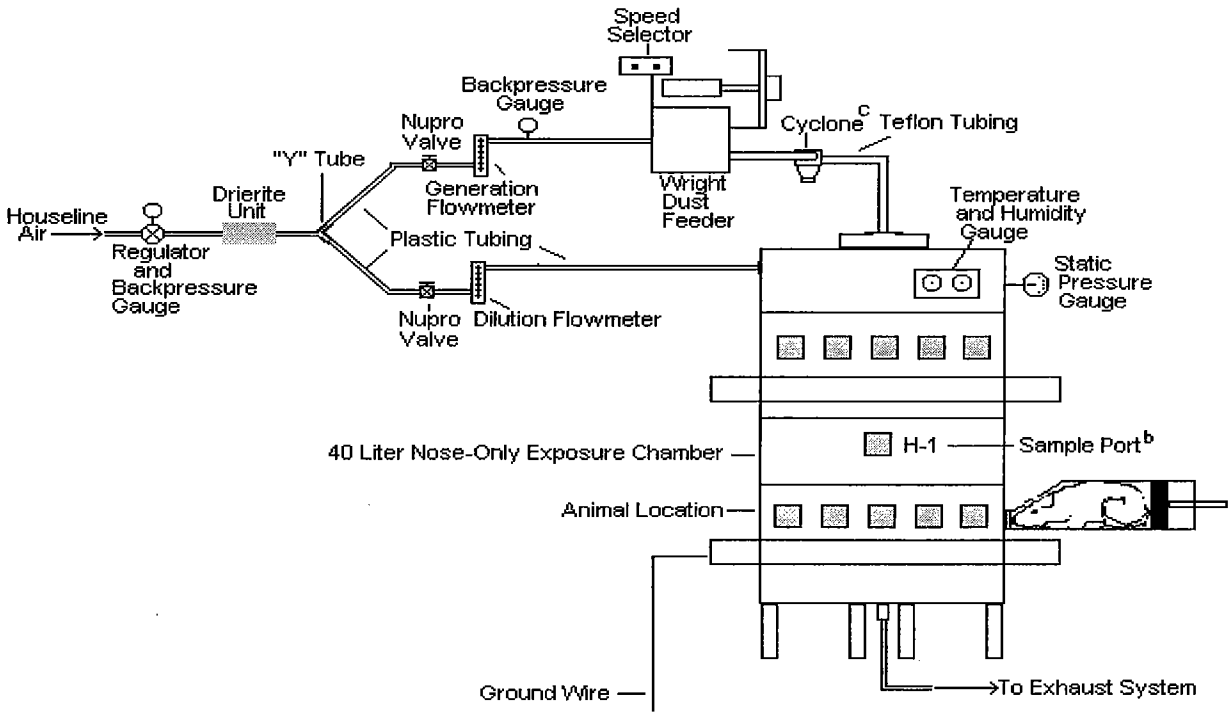
Group 1	Diagram of 40 Liter Nose-Only Exposure Chamber and Generation System[a]	Figure 1



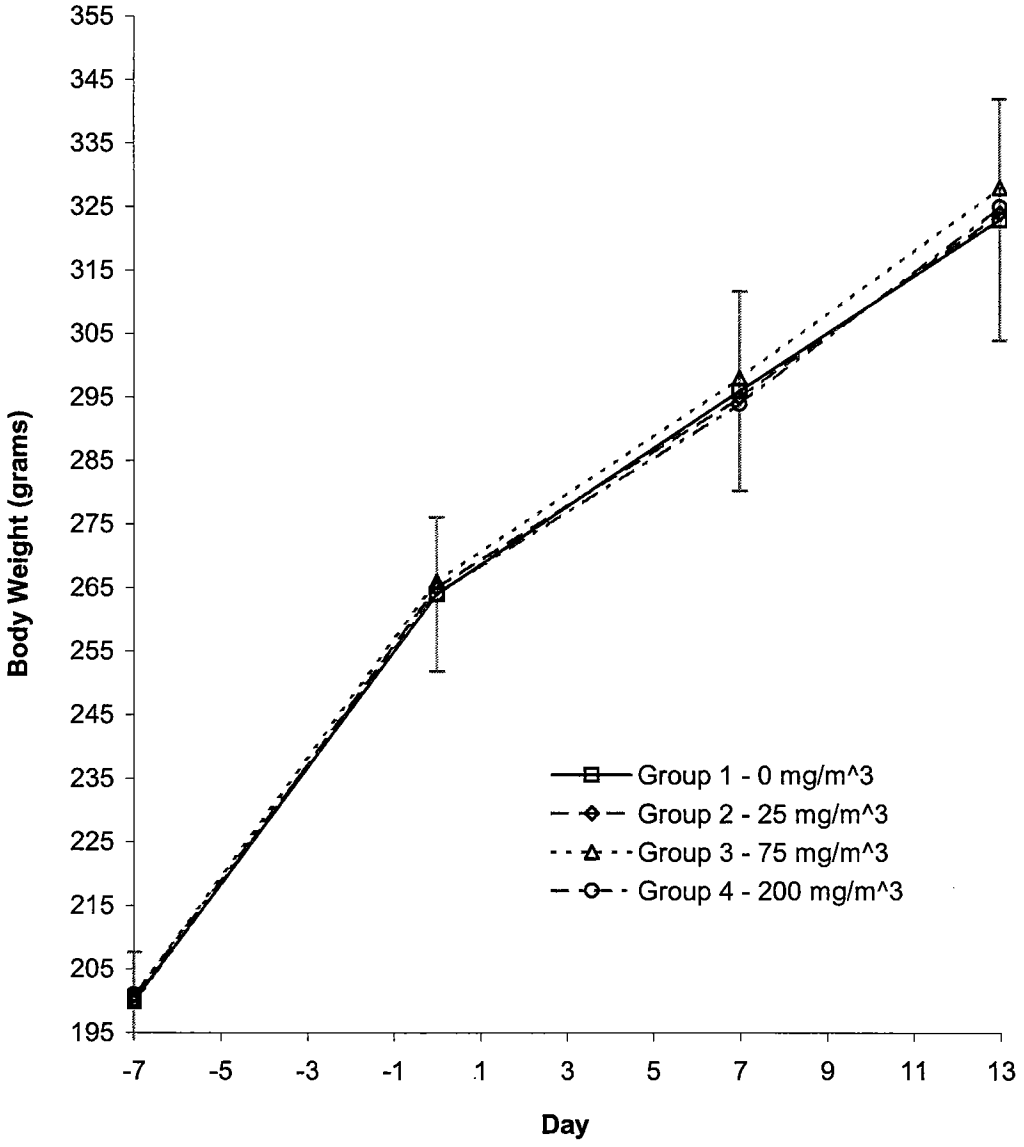
[a] System enclosed in 10 m^3 glass and stainless steel chamber.

Groups 2 - 4	Diagram of 40 Liter Nose-Only Exposure Chamber and Generation System[a]	Figure 1

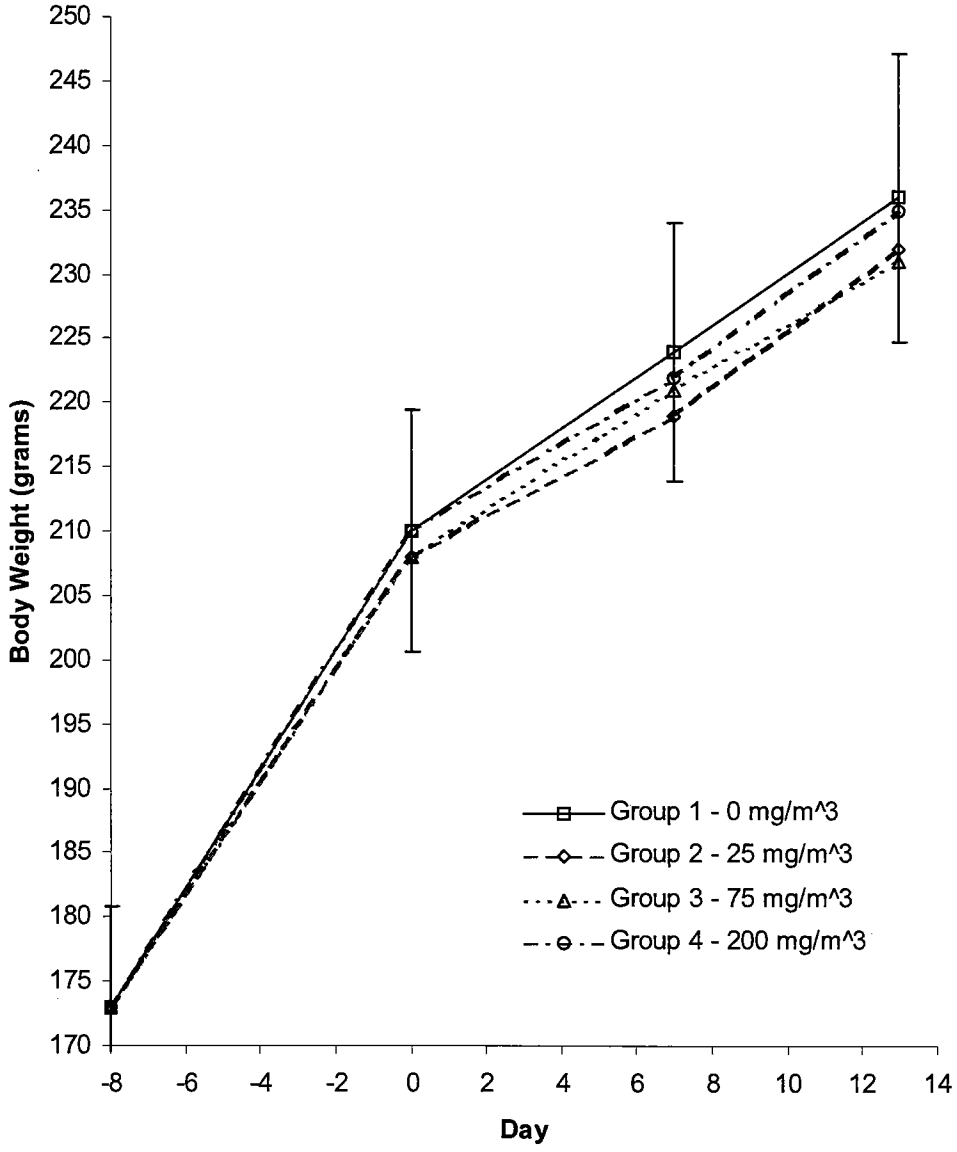


[a] System enclosed in 10 m^3 glass and stainless steel chamber.
[b] The distribution sample port (H-2) was located on the side opposite the H-1 port.
[c] A cyclone was not used for Group 4.

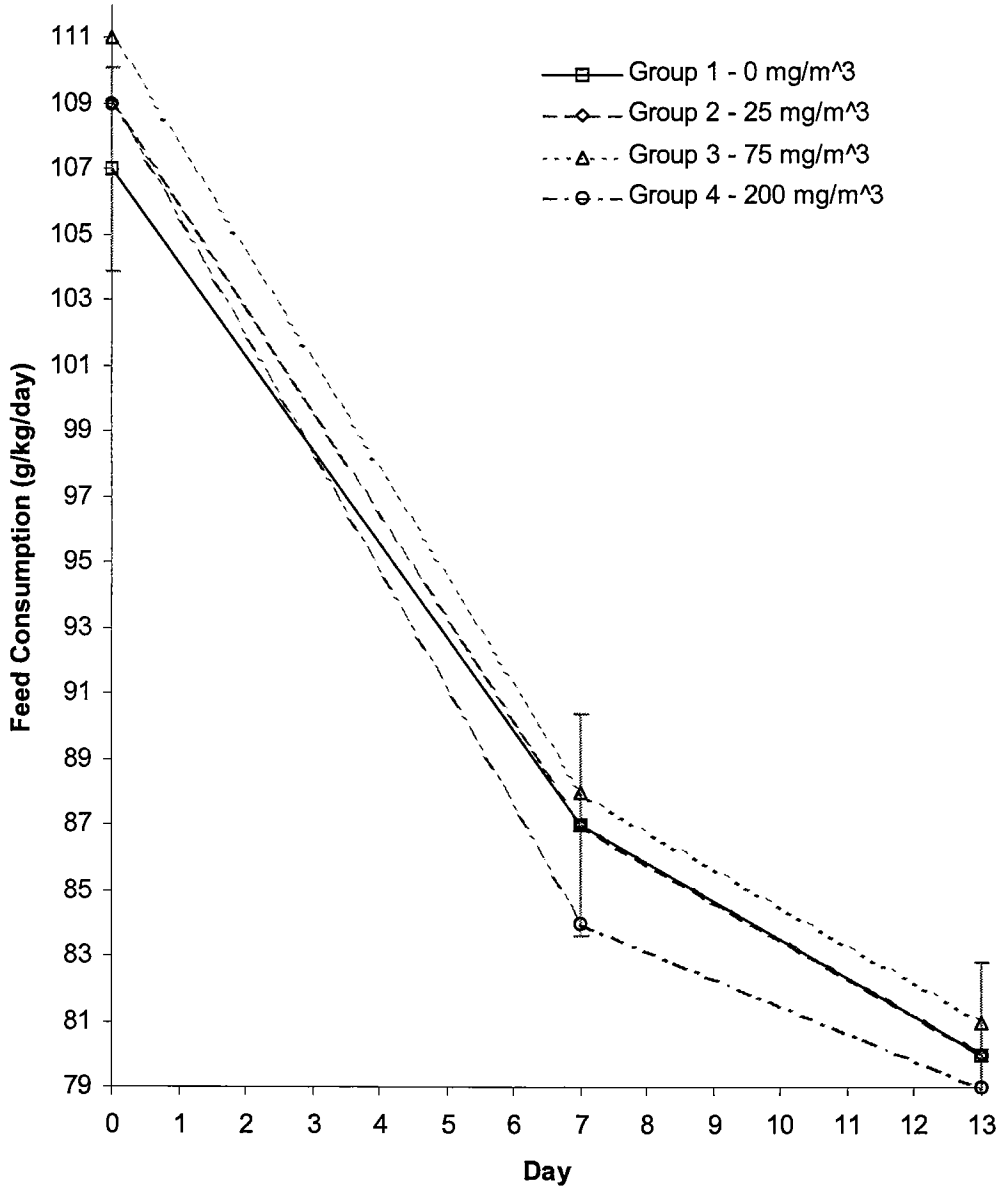
Males	Mean Body Weights	Figure 2



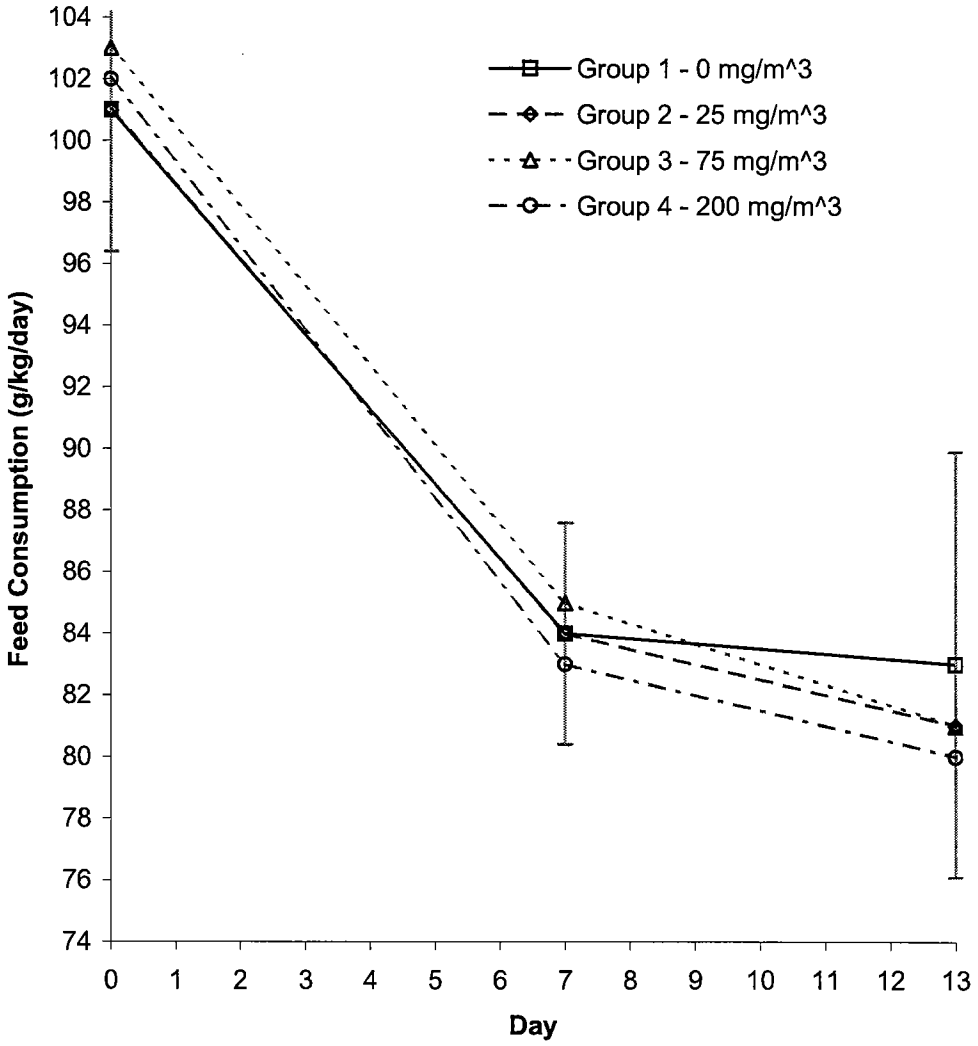
Females	Mean Body Weights	Figure 3



Males	Mean Feed Consumption	Figure 4



Females	Mean Feed Consumption	Figure 5



	General Preface	

General Notes

Individual animal data values presented in this report may be rounded. Unrounded individual animal data values are used to calculate the reported mean and standard deviation values. Therefore, use of the reported individual values to reproduce means, standard deviations and/or to perform any subsequent calculations may produce minor discrepancies between the calculated values and those presented in this report.

M = Male; F = Female

Summary of In-Chamber Observations — Table 1

Exposure Day	1[a]	2 1[b]	3 2	4 3	5 4	6 5	7 6	8 7	9 8	10 9	11 10	12 11	13 12	14 13	14
Group 1 – 0 mg/m^3															
Number Examined	10	20	20	20	20	20	20	20	20	20	20	20	20	20	10
Within Normal Limits	10	20	20	20	20	20	20	20	20	20	20	20	20	20	10
Group 2 – 25 mg/m^3															
Number Examined	10	20	20	20	20	20	20	20	20	20	20	20	20	20	10
Within Normal Limits	10	20	20	20	20	20	20	20	20	20	20	20	20	20	10
Group 3 – 75 mg/m^3															
Number Examined	10	20	20	20	20	20	20	20	20	20	20	20	20	20	10
Within Normal Limits	10	20	20	20	20	20	20	20	20	20	20	20	20	20	10
Group 4 – 200 mg/m^3															
Number Examined	10	20	20	20	20	20	20	20	20	20	20	20	20	20	10
Within Normal Limits	10	20	20	20	20	20	20	20	20	20	20	20	20	20	10

[a]Day 1 for the male animals.
[b]Day 1 for the female animals.

	Summary of Clinical Observations Preface	Table 2

Number of animals examined represents the total number of animals observed for a given interval.

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

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

Corresponding exposure levels for each group were as follows:

Group 1 - 0 mg/m^3
Group 2 - 25 mg/m^3
Group 3 - 75 mg/m^3
Group 4 - 200 mg/m^3

Huntingdon Life Sciences 03-6147M
MALE

TABLE 2

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

MALES — SUMMARY OF CLINICAL OBSERVATIONS

		DAY OF STUDY					
	GROUP#	-7	0	7	13	14	TOTAL
# OF ANIMALS EXAMINED	1	10	10	10	10	10	
	2	10	10	10	10	10	
	3	10	10	10	10	10	
	4	10	10	10	10	10	
NORMAL							
WITHIN NORMAL LIMITS	1	10	10	7	7	0	10
	2	10	10	0	0	0	10
	3	10	10	0	0	0	10
	4	10	10	0	0	0	10
DEAD							
Terminal Sacrifice	1	0	0	0	0	10	10
	2	0	0	0	0	10	10
	3	0	0	0	0	10	10
	4	0	0	0	0	10	10
APPEARANCE							
TEST MATERIAL ON FUR	1	0	0	0	0	0	0
(BLACK)	2	0	0	10	10	0	10
	3	0	0	10	10	0	10
	4	0	0	10	10	0	10
OCULAR							
Chromodacryorrhea -	1	0	0	2	1	0	2
Unilateral	2	0	0	0	0	0	0
	3	0	0	1	0	0	1
	4	0	0	0	0	0	0

Huntingdon Life Sciences 03-6147M
MALE

TABLE 2

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

MALES — SUMMARY OF CLINICAL OBSERVATIONS

		DAY OF STUDY					
	GROUP#	-7	0	7	13	14	TOTAL
# OF ANIMALS EXAMINED	1	10	10	10	10	10	
	2	10	10	10	10	10	
	3	10	10	10	10	10	
	4	10	10	10	10	10	
Chromodacryorrhea - Bilateral	1	0	0	0	0	0	0
	2	0	0	0	0	0	0
	3	0	0	1	0	0	1
	4	0	0	1	0	0	1
ORAL/BUCCAL							
Nasal Discharge - Red	1	0	0	3	3	0	4
	2	0	0	0	0	0	0
	3	0	0	0	0	0	0
	4	0	0	0	0	0	0

Huntingdon Life Sciences 03-6147F
FEMALE

TABLE 2

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

FEMALES — SUMMARY OF CLINICAL OBSERVATIONS

		DAY OF STUDY					
	GROUP#	-8	0	7	13	14	TOTAL
# OF ANIMALS EXAMINED	1	10	10	10	10	10	
	2	10	10	10	10	10	
	3	10	10	10	10	10	
	4	10	10	10	10	10	
NORMAL							
WITHIN NORMAL LIMITS	1	10	10	8	8	0	10
	2	10	10	0	0	0	10
	3	10	10	0	0	0	10
	4	10	10	0	0	0	10
DEAD							
Terminal Sacrifice	1	0	0	0	0	10	10
	2	0	0	0	0	10	10
	3	0	0	0	0	10	10
	4	0	0	0	0	10	10
APPEARANCE							
TEST MATERIAL ON FUR	1	0	0	0	0	0	0
(BLACK)	2	0	0	10	10	0	10
	3	0	0	10	10	0	10
	4	0	0	10	10	0	10
OCULAR							
Chromodacryorrhea -	1	0	0	2	2	0	2
Unilateral	2	0	0	0	0	0	0
	3	0	0	0	0	0	0
	4	0	0	1	1	0	1

Huntingdon Life Sciences 03-6147F
FEMALE

TABLE 2

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

FEMALES

SUMMARY OF CLINICAL OBSERVATIONS

		DAY OF STUDY					
	GROUP#	-8	0	7	13	14	TOTAL
# OF ANIMALS EXAMINED	1	10	10	10	10	10	
	2	10	10	10	10	10	
	3	10	10	10	10	10	
	4	10	10	10	10	10	
Chromodacryorrhea - Bilateral	1	0	0	0	0	0	0
	2	0	0	0	0	0	0
	3	0	0	1	0	0	1
	4	0	0	1	0	0	1

Huntingdon Life Sciences 03-6147M
MALE

TABLE 3

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

MALES — MEAN BODY WEIGHTS (GRAMS)

		DOSE GROUP:	1	2	3	4
		DOSE LEVEL (MG/M3):	0	25	75	200
DAY	-7	MEAN	200	200	201	201
		S.D.	7.7	7.3	7.9	8.6
		N	10	10	10	10
DAY	0	MEAN	264	265	266	264
		S.D.	12.1	8.8	9.9	11.3
		N	10	10	10	10
DAY	7	MEAN	296	295	298	294
		S.D.	15.7	16.6	15.9	13.5
		N	10	10	10	10
DAY	13	MEAN	323	324	328	325
		S.D.	19.0	23.5	17.9	15.4
		N	10	10	10	10

No statistically significant differences

Huntingdon Life Sciences 03-6147F
FEMALE

TABLE 3

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

FEMALES — MEAN BODY WEIGHTS (GRAMS)

		DOSE GROUP:	1	2	3	4
		DOSE LEVEL (MG/M3):	0	25	75	200
DAY	-8	MEAN	173	173	173	173
		S.D.	7.8	7.8	7.8	7.3
		N	10	10	10	10
DAY	0	MEAN	210	208	208	210
		S.D.	9.4	10.5	13.9	9.2
		N	10	10	10	10
DAY	7	MEAN	224	219	221	222
		S.D.	10.0	12.0	13.2	12.8
		N	10	10	10	10
DAY	13	MEAN	236	232	231	235
		S.D.	11.2	11.6	17.1	13.1
		N	10	10	10	10

No statistically significant differences

Huntingdon Life Sciences 03-6147M
MALE

TABLE 4

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

MALES — MEAN BODY WEIGHT CHANGE FROM INTERVAL TO INTERVAL (GRAMS)

		DOSE GROUP:	1	2	3	4
		DOSE LEVEL (MG/M3):	0	25	75	200
DAY	0 TO 7	MEAN	32	30	31	29
		S.D.	7.4	11.7	10.0	5.0
		N	10	10	10	10
DAY	7 TO 13	MEAN	26	29	30	32
		S.D.	5.3	7.9	6.4	3.9
		N	10	10	10	10
DAY	0 TO 13	MEAN	58	59	61	61
		S.D.	11.2	18.2	13.2	8.0
		N	10	10	10	10

No statistically significant differences

Huntingdon Life Sciences 03-6147F
FEMALE

TABLE 4

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

FEMALES — MEAN BODY WEIGHT CHANGE FROM INTERVAL TO INTERVAL (GRAMS)

		DOSE GROUP:	1	2	3	4
		DOSE LEVEL (MG/M3):	0	25	75	200
DAY	0 TO 7	MEAN	14	11	14	12
		S.D.	10.5	6.9	5.5	9.3
		N	10	10	10	10
DAY	7 TO 13	MEAN	12	13	10	13
		S.D.	7.6	6.9	7.2	6.4
		N	10	10	10	10
DAY	0 TO 13	MEAN	26	24	24	25
		S.D.	9.7	5.2	6.1	7.5
		N	10	10	10	10

No statistically significant differences

Huntingdon Life Sciences 03-6147M
MALE

TABLE 5

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

MALES — MEAN FEED CONSUMPTION VALUES (GRAMS/KG/DAY)

		DOSE GROUP:	1	2	3	4
		DOSE LEVEL (MG/M3):	0	25	75	200
DAY	0	MEAN	107	109	111	109
		S.D.	3.1	2.8	5.5	3.7
		N	10	10	10	10
DAY	7	MEAN	87	87	88	84
		S.D.	3.4	3.6	6.0	6.5
		N	10	10	10	10
DAY	13	MEAN	80	80	81	79
		S.D.	2.8	4.9	3.0	1.8
		N	10	10	10	10

No statistically significant differences

Huntingdon Life Sciences 03-6147F
FEMALE

TABLE 5

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

FEMALES — MEAN FEED CONSUMPTION VALUES (GRAMS/KG/DAY)

	DOSE GROUP:	1	2	3	4
	DOSE LEVEL (MG/M3):	0	25	75	200
DAY 0	MEAN	101	101	103	102
	S.D.	4.6	3.5	6.1	3.0
	N	10	10	9	9
DAY 7	MEAN	84	84	85	83
	S.D.	3.6	2.8	3.4	5.5
	N	10	10	10	10
DAY 13	MEAN	83	81	81	80
	S.D.	6.9	3.2	5.9	3.7
	N	10	10	10	10

No statistically significant differences

	Mean Organ Weights Preface	Table 6

Table of Contents

Key to Abbreviations:

g	=	Grams
wt.	=	Weight
observ.	=	Observed
semis w/prostate	=	Seminal vesicles

Corresponding exposure levels for each group were as follows:

Group 1 - 0 mg/m^3
Group 2 - 25 mg/m^3
Group 3 - 75 mg/m^3
Group 4 - 200 mg/m^3

Huntingdon Life Sciences
Princeton Research Center
East Millstone, New Jersey
Terminal Sacrifice

Summary statistics for absolute organ weights (g)
Study number: 036147

Group	Terminal Body wt. (g)	Adrenal Glands	Brain	Epididymides	Heart	Kidneys	Liver	Lungs
				Male Animals				
1								
Mean:	289.1	0.0581	1.9281	0.8372	1.1704	2.7726	10.6530	1.6978
Standard deviation:	18.2	0.0063	0.0638	0.0699	0.1005	0.1315	1.1241	0.2055
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
2								
Mean:	290.1	0.0572	1.9555	0.7993	1.2038	2.7946	10.8094	1.8967
Standard deviation:	20.3	0.0082	0.0991	0.0999	0.1163	0.2322	1.1355	0.1714
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
3								
Mean:	292.4	0.0612	1.9479	0.7989	1.2032	2.8141	10.7649	1.9129
Standard deviation:	16.3	0.0057	0.0717	0.0607	0.1101	0.3068	1.4373	0.2749
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
4								
Mean:	290.0	0.0569	1.9547	0.7858	1.2259	2.9085	10.4551	1.9841+
Standard deviation:	14.9	0.0079	0.0790	0.1131	0.1003	0.2266	0.6942	0.1249
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)

*(+) = mean value of group was significantly different from control at P = 0.05(0.01) with Dunnett's test of significance
%($) = mean value of group was significantly different from control at P = 0.05(0.01) with Modified T test of significance

Huntingdon Life Sciences
Princeton Research Center
East Millstone, New Jersey
Terminal Sacrifice

Summary statistics for absolute organ weights (g)
Study number: 036147

Group	Terminal Body wt. (g)	Semis w/prostate Pituitary gland	Spleen	Testes	Thymus
			Male Animals		
1					
Mean:	289.1	0.0079	1.7562	0.6106	3.0666	0.5312
Standard deviation:	18.2	0.0022	0.2477	0.0861	0.2086	0.0819
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)
2					
Mean:	290.1	0.0098*	1.7836	0.6234	3.1733	0.5228
Standard deviation:	20.3	0.0011	0.2351	0.0612	0.1766	0.1629
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)
3					
Mean:	292.4	0.0100+	1.8564	0.6274	3.0272	0.5269
Standard deviation:	16.3	0.0011	0.1836	0.0702	0.3431	0.1138
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)
4					
Mean:	290.0	0.0102+	1.6842	0.6109	3.0587	0.4784
Standard deviation:	14.9	0.0012	0.2396	0.0674	0.3078	0.0885
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)

*(+) = mean value of group was significantly different from control at P = 0.05(0.01) with Dunnett's test of significance
%($) = mean value of group was significantly different from control at P = 0.05(0.01) with Modified T test of significance

Huntingdon Life Sciences
Princeton Research Center
East Millstone, New Jersey
Terminal Sacrifice

Summary statistics for absolute organ weights (g)
Study number: 036147

Group	Terminal Body wt. (g)	Adrenal Glands	Brain	Heart	Kidneys	Liver	Lungs	Ovaries
				Female Animals				
1								
Mean:	209.1	0.0694	1.8873	0.8816	1.9269	7.8776	1.5714	0.0954
Standard deviation:	8.7	0.0087	0.0596	0.0656	0.1558	0.8528	0.1644	0.0188
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
2								
Mean:	205.2	0.0728	1.8821	0.8669	1.9193	8.2483	1.4827	0.0882
Standard deviation:	10.8	0.0093	0.0691	0.0671	0.1382	0.7047	0.3014	0.0091
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
3								
Mean:	203.5	0.0746	1.8632	0.8846	1.8737	7.8500	1.5393	0.0800*
Standard deviation:	15.4	0.0109	0.0566	0.1203	0.2322	1.0285	0.2808	0.0108
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
4								
Mean:	207.2	0.0738	1.8412	0.8723	1.9442	7.9281	1.7683	0.0966
Standard deviation:	10.5	0.0067	0.0494	0.0706	0.1219	0.5456	0.1944	0.0126
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)

*(+) = mean value of group was significantly different from control at P = 0.05(0.01) with Dunnett's test of significance
%($) = mean value of group was significantly different from control at P = 0.05(0.01) with Modified T test of significance

Huntingdon Life Sciences
Princeton Research Center
East Millstone, New Jersey
Terminal Sacrifice

Summary statistics for absolute organ weights (g)
Study number: 036147

Group	Terminal Body wt. (g)	Pituitary gland	Spleen	Thymus	Uterus
			Female Animals		
1					
Mean:	209.1	0.0119	0.5171	0.5576	0.5998
Standard deviation:	8.7	0.0029	0.0527	0.1004	0.1589
Number of observ. :	(10)	(10)	(10)	(10)	(10)
2					
Mean:	205.2	0.0140	0.4885	0.5189	0.6050
Standard deviation:	10.8	0.0006	0.0686	0.0770	0.1945
Number of observ. :	(10)	(10)	(10)	(10)	(10)
3					
Mean:	203.5	0.0133	0.4902	0.5132	0.5913
Standard deviation:	15.4	0.0019	0.0722	0.0947	0.1537
Number of observ. :	(10)	(10)	(10)	(10)	(10)
4					
Mean:	207.2	0.0116	0.5249	0.4952	0.6783
Standard deviation:	10.5	0.0045	0.0996	0.0985	0.2118
Number of observ. :	(10)	(10)	(10)	(10)	(10)

*(+) = mean value of group was significantly different from control at P = 0.05(0.01) with Dunnett's test of significance
%($) = mean value of group was significantly different from control at P = 0.05(0.01) with Modified T test of significance

Huntingdon Life Sciences
Princeton Research Center
East Millstone, New Jersey
Terminal Sacrifice

Summary Statistics for % Organ to Body Weight
Study number: 036147

Group	Terminal Body wt. (g)	Adrenal Glands	Brain	Epididymides	Heart	Kidneys	Liver	Lungs
				Male Animals				
1								
Mean:	289.1	0.0202	0.6685	0.2903	0.4051	0.9608	3.6863	0.5868
Standard deviation:	18.2	0.0026	0.0331	0.0269	0.0292	0.0471	0.3353	0.0557
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
2								
Mean:	290.1	0.0198	0.6767	0.2763	0.4150	0.9633	3.7377	0.6541*
Standard deviation:	20.3	0.0035	0.0537	0.0358	0.0288	0.0418	0.4347	0.0434
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
3								
Mean:	292.4	0.0210	0.6674	0.2734	0.4114	0.9611	3.6729	0.6543*
Standard deviation:	16.3	0.0019	0.0328	0.0185	0.0298	0.0804	0.3600	0.0891
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
4								
Mean:	290.0	0.0197	0.6755	0.2713	0.4232	1.0038	3.6116	0.6850+
Standard deviation:	14.9	0.0029	0.0379	0.0390	0.0329	0.0712	0.2677	0.0421
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)

*(+) = mean value of group was significantly different from control at P = 0.05(0.01) with Dunnett's test of significance
%($) = mean value of group was significantly different from control at P = 0.05(0.01) with Modified T test of significance

Huntingdon Life Sciences
Princeton Research Center
East Millstone, New Jersey
Terminal Sacrifice

Summary Statistics for % Organ to Body Weight
Study number: 036147

Group	Terminal Body wt. (g)	Semis w/prostate Pituitary gland	Spleen	Testes	Thymus
			Male Animals		
1					
Mean:	289.1	0.0027	0.6075	0.2110	1.0644	0.1841
Standard deviation:	18.2	0.0008	0.0791	0.0237	0.0967	0.0285
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)
2					
Mean:	290.1	0.0034	0.6149	0.2149	1.0982	0.1798
Standard deviation:	20.3	0.0005	0.0701	0.0148	0.0929	0.0511
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)
3					
Mean:	292.4	0.0034	0.6366	0.2147	1.0390	0.1797
Standard deviation:	16.3	0.0004	0.0729	0.0225	0.1393	0.0350
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)
4					
Mean:	290.0	0.0035%	0.5816	0.2104	1.0561	0.1652
Standard deviation:	14.9	0.0004	0.0815	0.0171	0.1049	0.0308
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)

*(+) = mean value of group was significantly different from control at P = 0.05(0.01) with Dunnett's test of significance
%($) = mean value of group was significantly different from control at P = 0.05(0.01) with Modified T test of significance

Huntingdon Life Sciences
Princeton Research Center
East Millstone, New Jersey
Terminal Sacrifice

Summary Statistics for % Organ to Body Weight
Study number: 036147

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Group	Terminal Body wt. (g)	Adrenal Glands	Brain	Heart	Kidneys	Liver	Lungs	Ovaries
			Female Animals					
1								
Mean:	209.1	0.0331	0.9041	0.4214	0.9208	3.7621	0.7534	0.0455
Standard deviation:	8.7	0.0038	0.0494	0.0219	0.0514	0.3205	0.0912	0.0079
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
2								
Mean:	205.2	0.0356	0.9198	0.4226	0.9360	4.0253	0.7278	0.0430
Standard deviation:	10.8	0.0053	0.0666	0.0275	0.0586	0.3546	0.1755	0.0049
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
3								
Mean:	203.5	0.0366	0.9213	0.4345	0.9193	3.8548	0.7552	0.0394
Standard deviation:	15.4	0.0041	0.0897	0.0445	0.0721	0.3761	0.1173	0.0050
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
4								
Mean:	207.2	0.0357	0.8904	0.4209	0.9396	3.8338	0.8528	0.0467
Standard deviation:	10.5	0.0033	0.0495	0.0256	0.0645	0.3178	0.0760	0.0060
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)

*(+) = mean value of group was significantly different from control at P = 0.05(0.01) with Dunnett's test of significance
%($) = mean value of group was significantly different from control at P = 0.05(0.01) with Modified T test of significance

Huntingdon Life Sciences
Princeton Research Center
East Millstone, New Jersey
Terminal Sacrifice

Summary Statistics for % Organ to Body Weight
Study number: 036147

Group	Terminal Body wt. (g)	Pituitary gland	Spleen	Thymus	Uterus
			Female Animals		
1					
Mean:	209.1	0.0057	0.2476	0.2674	0.2861
Standard deviation:	8.7	0.0013	0.0255	0.0502	0.0713
Number of observ. :	(10)	(10)	(10)	(10)	(10)
2					
Mean:	205.2	0.0068%	0.2382	0.2529	0.2962
Standard deviation:	10.8	0.0005	0.0333	0.0346	0.0996
Number of observ. :	(10)	(10)	(10)	(10)	(10)
3					
Mean:	203.5	0.0066	0.2403	0.2519	0.2898
Standard deviation:	15.4	0.0010	0.0251	0.0411	0.0668
Number of observ. :	(10)	(10)	(10)	(10)	(10)
4					
Mean:	207.2	0.0056	0.2525	0.2392	0.3271
Standard deviation:	10.5	0.0022	0.0399	0.0489	0.0986
Number of observ. :	(10)	(10)	(10)	(10)	(10)

*(+) = mean value of group was significantly different from control at P = 0.05(0.01) with Dunnett's test of significance
%($) = mean value of group was significantly different from control at P = 0.05(0.01) with Modified T test of significance

Huntingdon Life Sciences
Princeton Research Center
East Millstone, New Jersey
Terminal Sacrifice

Summary Statistics for % Organ to Brain Weight
Study number: 036147

Group	Terminal Body wt. (g)	Adrenal Glands	Brain	Epididymides	Heart	Kidneys	Liver	Lungs
				Male Animals				
1								
Mean:	289.1	3.0140	100.0000	43.4246	60.6473	143.8586	552.2018	87.9308
Standard deviation:	18.2	0.3344	0.0000	3.3229	4.0306	6.5480	51.2122	8.9177
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
2								
Mean:	290.1	2.9265	100.0000	40.8788	61.6734	143.1869	553.1696	97.3402
Standard deviation:	20.3	0.4067	0.0000	4.6716	6.3917	13.1060	54.7162	11.5398
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
3								
Mean:	292.4	3.1449	100.0000	41.0586	61.7693	144.4490	551.7009	97.9754
Standard deviation:	16.3	0.3151	0.0000	3.3991	5.1712	14.9485	62.2661	11.6529
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
4								
Mean:	290.0	2.9145	100.0000	40.2125	62.7396	148.8471	535.2709	101.5752*
Standard deviation:	14.9	0.4074	0.0000	5.5929	4.8524	10.7335	35.8176	6.4333
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)

*(+) = mean value of group was significantly different from control at P = 0.05(0.01) with Dunnett's test of significance
%($) = mean value of group was significantly different from control at P = 0.05(0.01) with Modified T test of significance

Huntingdon Life Sciences
Princeton Research Center
East Millstone, New Jersey
Terminal Sacrifice

Summary Statistics for % Organ to Brain Weight
Study number: 036147

Group	Terminal Body wt. (g)	Semis w/prostate Pituitary gland	Spleen	Testes	Thymus
			Male Animals		
1					
Mean:	289.1	0.4080	91.0915	31.6004	159.1062	27.5349
Standard deviation:	18.2	0.1147	12.5856	3.7230	10.4473	4.0340
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)
2						
Mean:	290.1	0.5012*	91.6498	31.9349	162.6879	26.5731
Standard deviation:	20.3	0.0698	14.6122	3.3657	12.7244	7.1039
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)
3						
Mean:	292.4	0.5110*	95.5580	32.2136	155.5860	27.0076
Standard deviation:	16.3	0.0583	11.3027	3.5249	18.2033	5.5834
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)
4						
Mean:	290.0	0.5238+	86.0387	31.2429	156.3267	24.5106
Standard deviation:	14.9	0.0572	10.2473	3.1972	12.3801	4.5774
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)

*(+) = mean value of group was significantly different from control at P = 0.05(0.01) with Dunnett's test of significance
%($) = mean value of group was significantly different from control at P = 0.05(0.01) with Modified T test of significance

Huntingdon Life Sciences
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Summary Statistics for % Organ to Brain Weight
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Group	Terminal Body wt. (g)	Adrenal Glands	Brain	Heart	Kidneys	Liver	Lungs	Ovaries
			Female Animals					
1								
Mean:	209.1	3.6783	100.0000	46.7684	102.2327	417.6746	83.1995	5.0517
Standard deviation:	8.7	0.4730	0.0000	4.0273	9.4727	45.8749	7.5905	0.9632
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
2								
Mean:	205.2	3.8754	100.0000	46.0741	102.1057	438.7241	78.6538	4.6947
Standard deviation:	10.8	0.5644	0.0000	3.3556	8.2196	39.5412	14.7376	0.5654
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
3								
Mean:	203.5	4.0155	100.0000	47.6261	100.8253	421.3821	82.5821	4.2956
Standard deviation:	15.4	0.6668	0.0000	7.6307	14.4688	53.3788	14.6658	0.5745
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
4								
Mean:	207.2	4.0128	100.0000	47.4499	105.5877	430.7166	96.0870	5.2445
Standard deviation:	10.5	0.3917	0.0000	4.5366	5.8509	29.4381	10.6748	0.6444
Number of observ. :	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)

*(+) = mean value of group was significantly different from control at P = 0.05(0.01) with Dunnett's test of significance
%($) = mean value of group was significantly different from control at P = 0.05(0.01) with Modified T test of significance

Huntingdon Life Sciences
Princeton Research Center
East Millstone, New Jersey
Terminal Sacrifice

Summary Statistics for % Organ to Brain Weight
Study number: 036147

Group	Terminal Body wt. (g)	Pituitary gland	Spleen	Thymus	Uterus
			Female Animals		
1					
Mean:	209.1	0.6283	27.4015	29.4569	31.6963
Standard deviation:	8.7	0.1507	2.7680	4.6726	7.9027
Number of observ. :	(10)	(10)	(10)	(10)	(10)
2					
Mean:	205.2	0.7460%	25.9579	27.5918	32.0962
Standard deviation:	10.8	0.0457	3.5360	4.1516	10.0479
Number of observ. :	(10)	(10)	(10)	(10)	(10)
3					
Mean:	203.5	0.7153	26.4065	27.6714	31.7636
Standard deviation:	15.4	0.1008	4.4950	5.8310	8.3577
Number of observ. :	(10)	(10)	(10)	(10)	(10)
4					
Mean:	207.2	0.6281	28.5062	26.8502	36.9098
Standard deviation:	10.5	0.2415	5.3351	5.0850	11.7942
Number of observ. :	(10)	(10)	(10)	(10)	(10)

*(+) = mean value of group was significantly different from control at P = 0.05(0.01) with Dunnett's test of significance
%($) = mean value of group was significantly different from control at P = 0.05(0.01) with Modified T test of significance

	Incidence Summary Report for Gross Necropsy Observations Preface	Table 7

Key to Abbreviation:

LN = Lymph Node

Corresponding exposure levels for each group were as follows:

Group 1 - 0 mg/m^3
Group 2 - 25 mg/m^3
Group 3 - 75 mg/m^3
Group 4 - 200 mg/m^3

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Princeton Research Center
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Terminal Sacrifice

Incidence Summary Report for Gross Necropsy Observations
Study number: 036147

	-- Males --				-- Females --			
Group:	1	2	3	4	1	2	3	4
Number in group:	10	10	10	10	10	10	10	10
Within normal limits	10	0	0	0	10	0	0	0
Epididymides								
Small	0	0	1	0	0	0	0	0
Lungs								
Discolored	0	10	10	10	0	10	10	10
Mediastinal LN								
Discolored	0	0	3	10	0	1	6	10
Enlarged	0	4	5	7	0	2	4	7
Prostate								
Small	0	0	1	0	0	0	0	0
Testes								
Enlarged	0	0	1	0	0	0	0	0
Small	0	0	1	0	0	0	0	0

	Incidence Summary of Microscopic Findings with Severity Levels Preface	Table 8

Key to Abbreviations

Ctls	=	Controls
NAD	=	No abnormal diagnoses
No.	=	Number

Corresponding exposure levels for each group were as follows:

Group 1 - 0 mg/m^3
Group 2 - 25 mg/m^3
Group 3 - 75 mg/m^3
Group 4 - 200 mg/m^3

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures

Incidence Summary of Microscopic Findings with Severity Levels
Terminal Sacrifice

Controls from group(s): 1	Animal sex:	-- Animals Affected -- Males --				-- Animals Affected -- Females --			
	Dosage group:	Ctls	2	3	4	Ctls	2	3	4
Tissues With Diagnoses	No. in group:	10	10	10	10	10	10	10	10
Lungs .....Number examined:		10	10	10	10	10	10	10	10
BROWN-BLACK PIGMENT DEPOSITS									
	Nad>	10	1	0	0	10	0	0	0
	Slight>	0	7	1	0	0	8	2	0
	Moderate>	0	2	9	10	0	2	8	10
.....Total Incidence of Finding Observed:		0	9	10	10	0	10	10	10
BRONCHIOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY									
	Nad>	10	10	8	2	10	10	9	6
	Slight>	0	0	2	8	0	0	1	4
.....Total Incidence of Finding Observed:		0	0	2	8	0	0	1	4
ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY									
	Nad>	10	4	2	0	8	4	0	0
	Slight>	0	4	6	2	2	5	5	2
	Moderate>	0	2	2	8	0	1	5	8
.....Total Incidence of Finding Observed:		0	6	8	10	2	6	10	10
ALVEOLAR/INTRAALVEOLAR MACROPHAGES									
	Minimal>	10	0	0	0	7	0	0	0
	Slight>	0	6	3	0	3	9	3	0
	Moderate>	0	4	7	10	0	1	7	10
.....Total Incidence of Finding Observed:		10	10	10	10	10	10	10	10
BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT -DEPOSITS									
	Nad>	10	5	3	6	10	6	5	3
	Minimal>	0	1	3	0	0	3	2	1
	Slight>	0	0	3	1	0	0	0	2
	Moderate>	0	4	1	3	0	1	3	4
.....Total Incidence of Finding Observed:		0	5	7	4	0	4	5	7

All Diagnoses; Phases: P2; Death types: All unscheduled plus FS; Date of death range: 16-Mar-04 To 17-Mar-04

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures

Incidence Summary of Microscopic Findings with Severity Levels
Terminal Sacrifice

Controls from group(s): 1	Animal sex:	-- Animals Affected -- Males --				-- Females --			
	Dosage group:	Ctls	2	3	4	Ctls	2	3	4
Tissues With Diagnoses	No. in group:	10	10	10	10	10	10	10	10
Lungs	Number examined:	10	10	10	10	10	10	10	10
OSSEOUS METAPLASIA									
	Nad>	10	10	9	10	10	10	9	10
	Slight>	0	0	1	0	0	0	1	0
.....Total Incidence of Finding	Observed:	0	0	1	0	0	0	1	0

All Diagnoses; Phases: P2; Death types: All unscheduled plus FS; Date of death range: 16-Mar-04 To 17-Mar-04

Chamber Monitoring Results
Cumulative Exposure Record
Group 1 - 0 mg/m^3 (Air only)

Day	Date	Exposure Number		Gravimetric Chamber Concentration						Particle Size Determinations[a]			Chamber Environment Mean	
				Nominal	Mean	Individual				MMAD	GSD	TMC	Temperature	Humidity
		M	F	(mg/m^3)	(mg/m^3)	(mg/m^3)				(µm)		(mg/m^3)	(°C)	(%)
0	2-Mar-04	1		0	0.00	0.00	0.00	0.00	0.00	2.753	1.693	5.50E-05	21	26
1	3-Mar-04	2	1	0	0.00	0.00	0.00	0.00	0.00	1.059	1.500	3.13E-05	22	28
2	4-Mar-04	3	2	0	0.00	0.00	0.00	0.00	0.00	1.244	1.726	3.60E-05	21	28
3	5-Mar-04	4	3	0	0.00	0.00	0.00	0.00	0.00	2.696	1.624	6.96E-05	20	29
4	6-Mar-04	5	4	0	0.00	0.00	0.00	0.00	0.00	4.084	1.834	3.46E-04	21	33
5	7-Mar-04	6	5	0	0.00	0.00	0.00	0.00	0.00	2.588	1.840	3.80E-04	21	29
6	8-Mar-04	7	6	0	0.00	0.00	0.00	0.00	0.00	2.339	1.865	3.53E-04	20	28
7	9-Mar-04	8	7	0	0.00	0.00	0.00	0.00	0.00	4.971	2.267	2.41E-04	19	29
8	10-Mar-04	9	8	0	0.00	0.00	0.00	0.00	0.00	2.583	1.520	3.00E-04	19	30
9	11-Mar-04	10	9	0	0.00	0.00	0.00	0.00	0.00	0.8248	1.241	1.08E-05	19	19
10	12-Mar-04	11	10	0	0.00	0.00	0.00	0.00	0.00	5.021	1.794	1.96E-04	20	18
11	13-Mar-04	12	11	0	0.00	0.00	0.00	0.00	0.00	0.8984	1.318	2.60E-05	19	17
12	14-Mar-04	13	12	0	0.00	0.00	0.00	0.00	0.00	1.465	1.409	2.24E-05	19	18
13	15-Mar-04	14	13	0	0.00	0.00	0.00	0.00	0.00	2.844	1.816	2.70E-04	20	17
14	16-Mar-04		14	0	0.00	0.00	0.00	0.00	0.00	0.6487	1.172	4.41E-06	19	11
Mean				**0**		**0.00**				**2.526**	**1.675**	**1.67E-04**	**20**	**24**
S.D.				**0**		**0.00**				**1.396**	**0.266**	**1.42E-04**	**1**	**7**

M = Male; F = Female

[a]Average daily room air samples were : MMAD = 2.674 ; GSD = 1.857; TMC = 3.80E-02

Chamber Monitoring Results
Cumulative Exposure Record
Group 2 - 25 mg/m^3

Day	Date	Exposure Number		Gravimetric Chamber Concentration						Particle Size Determinations					Chamber Environment	
				Nominal	Mean	Individual				MMAD	GSD	% of Particles			Mean Temperature	Humidity
		M	F	(mg/m^3)	(mg/m^3)	(mg/m^3)				(μm)		≤ 1 μm	≤ 3 μm	≤ 10 μm	(°C)	(%)
0	2-Mar-04	1		12	19.3	8.3	23	22	24	1.185	2.371	42.21	85.91	99.33	21	23
1	3-Mar-04	2	1	29	23.8	23	22	24	26	2.076	3.466	27.84	61.65	89.70	22	26
2	4-Mar-04	3	2	22	22.5	23	21	22	24	2.069	2.695	23.16	64.61	94.40	21	31
3	5-Mar-04	4	3	30	21.5	15	21	27	23	1.685	2.731	30.18	71.71	96.19	21	29
4	6-Mar-04	5	4	28	25.8	27	28	27	21	1.730	2.578	28.15	71.95	96.80	21	33
5	7-Mar-04	6	5	19	21.5	16	23	26	21	1.528	3.101	35.41	72.45	95.16	21	31
6	8-Mar-04	7	6	17	22.3	16	22	27	24	1.233	2.059	38.61	89.09	99.81	21	30
7	9-Mar-04	8	7	23	26.3	20	28	30	27	1.355	2.960	38.98	76.81	96.72	19	30
8	10-Mar-04	9	8	16	24.0	22	21	26	27	1.629	3.057	33.12	70.77	94.78	20	31
9	11-Mar-04	10	9	24	21.3	15	19	24	27	1.185	2.268	41.78	87.16	99.54	20	21
10	12-Mar-04	11	10	29	26.8	22	28	32	25	1.289	2.708	39.94	80.18	98.01	20	20
11	13-Mar-04	12	11	34	28.3	20	26	43	24	1.624	2.935	32.62	71.56	95.43	20	18
12	14-Mar-04	13	12	18	24.0	15	19	25	37	1.808	2.212	22.80	73.83	98.44	19	20
13	15-Mar-04	14	13	32	24.5	25	27	23	23	1.955	2.971	26.91	65.30	93.31	21	20
14	16-Mar-04		14	29	24.8	19	25	27	28	1.432	2.485	34.66	79.17	98.36	20	17
Mean				**24**		**23.8**				**1.586**	**2.706**	**33.09**	**74.81**	**96.40**	**21**	**26**
S.D.				**7**		**5.2**				**0.306**	**0.385**	**6.45**	**8.24**	**2.73**	**1**	**5**

M = Male; F = Female

Chamber Monitoring Results
Cumulative Exposure Record
Group 3 - 75 mg/m^3

Day	Date	Exposure Number		Gravimetric Chamber Concentration						Particle Size Determinations					Chamber Environment	
				Nominal	Mean	Individual				MMAD	GSD	% of Particles			Mean Temperature	Humidity
		M	F	(mg/m^3)	(mg/m^3)	(mg/m^3)				(μm)		≤ 1 μm	≤ 3 μm	≤ 10 μm	(°C)	(%)
0	2-Mar-04	1		78	44.3	36	48	44	51	1.493	3.344	36.99	71.83	94.24	21	33
1	3-Mar-04	2	1	73	53.5	55	45	54	60	2.808	3.377	19.81	52.17	85.17	23	32
2	4-Mar-04	3	2	170	84.8	76	91	80	92	2.632	2.792	17.30	55.07	90.32	22	37
3	5-Mar-04	4	3	160	82.0	56	93	100	79	1.846	2.266	22.68	72.35	98.05	21	37
4	6-Mar-04	5	4	140	83.5	73	87	91	83	2.552	2.869	18.70	56.10	90.25	22	46
5	7-Mar-04	6	5	140	66.0	48	71	72	73	1.631	2.538	29.97	74.35	97.42	21	30
6	8-Mar-04	7	6	130	62.8	56	68	68	59	1.659	2.200	26.05	77.38	98.87	21	32
7	9-Mar-04	8	7	150	67.8	58	72	68	73	2.065	2.820	24.21	64.07	93.59	20	32
8	10-Mar-04	9	8	150	72.8	82	70	73	66	2.088	2.710	23.02	64.19	94.19	20	33
9	11-Mar-04	10	9	150	57.8	31	38	81	81	1.667	2.152	25.23	77.83	99.03	20	22
10	12-Mar-04	11	10	150	64.8	56	62	70	71	2.280	2.924	22.12	60.09	91.58	20	20
11	13-Mar-04	12	11	150	72.3	61	74	82	72	2.090	2.332	19.19	66.53	96.78	20	17
12	14-Mar-04	13	12	140	69.5	61	70	74	73	2.186	2.157	15.45	65.98	97.61	19	16
13	15-Mar-04	14	13	130	72.3	66	74	74	75	2.989	2.880	15.04	50.14	87.32	21	21
14	16-Mar-04		14	130	74.3	61	73	86	77	2.628	2.396	13.44	56.02	93.69	20	20
		Mean		**136**		**68.6**				**2.174**	**2.650**	**21.95**	**64.27**	**93.87**	**21**	**29**
		S.D.		**27**		**14.5**				**0.467**	**0.402**	**6.16**	**9.15**	**4.26**	**1**	**9**

M = Male; F = Female

Chamber Monitoring Results
Cumulative Exposure Record
Group 4 - 200 mg/m^3

Day	Date	Exposure Number		Gravimetric Chamber Concentration						Particle Size Determinations					Chamber Environment	
				Nominal	Mean	Individual				MMAD	GSD	% of Particles			Mean Temperature	Humidity
		M	F	(mg/m^3)	(mg/m^3)	(mg/m^3)				(μm)		≤ 1 μm	≤ 3 μm	≤ 10 μm	(°C)	(%)
0	2-Mar-04	1		490	183	140	160	220	210	2.075	2.644	22.64	64.77	94.71	21	25
1	3-Mar-04	2	1	500	165	130	140	170	220	3.061	3.002	15.44	49.26	85.92	22	29
2	4-Mar-04	3	2	530	173	140	210	170	170	2.414	2.855	20.05	58.21	91.23	21	34
3	5-Mar-04	4	3	520	193	240	180	150	200	2.061	2.430	20.77	66.38	96.24	21	34
4	6-Mar-04	5	4	530	195	170	190	220	200	2.748	2.417	12.60	53.96	92.83	21	38
5	7-Mar-04	6	5	590	188	170	190	200	190	2.603	2.591	15.75	55.92	92.12	21	32
6	8-Mar-04	7	6	540	223	260	200	220	210	1.694	2.684	29.66	71.85	96.39	20	32
7	9-Mar-04	8	7	550	198	150	230	180	230	2.016	2.922	25.67	64.47	93.24	19	32
8	10-Mar-04	9	8	590	195	190	210	170	210	2.589	2.768	17.51	55.76	90.78	19	33
9	11-Mar-04	10	9	620	198	140	200	210	240	2.213	2.449	18.76	63.29	95.39	19	22
10	12-Mar-04	11	10	610	215	170	220	260	210	2.502	2.757	18.29	57.11	91.41	20	21
11	13-Mar-04	12	11	630	205	160	240	220	200	2.535	2.506	15.56	57.27	93.24	20	20
12	14-Mar-04	13	12	620	223	150	280	210	250	2.616	2.749	17.08	55.39	90.76	19	18
13	15-Mar-04	14	13	570	218	170	250	230	220	3.004	2.464	11.13	49.94	90.89	20	21
14	16-Mar-04		14	560	213	190	190	220	250	2.355	2.578	18.29	60.09	93.66	19	19
		Mean		**563**		**199**				**2.432**	**2.654**	**18.61**	**58.91**	**92.59**	**20**	**27**
		S.D.		**45**		**35**				**0.374**	**0.186**	**4.77**	**6.24**	**2.67**	**1**	**7**

M = Male; F = Female

Huntingdon Life Sciences 03-6147M
MALE

APPENDIX B

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

ANIMAL TERMINATION HISTORY

MALES GROUP 1 0 MG/M3

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	WEEK OF STUDY	STUDY DAY
1001	Terminal Sacrifice	16-MAR-04	3	14
1002	Terminal Sacrifice	16-MAR-04	3	14
1003	Terminal Sacrifice	16-MAR-04	3	14
1004	Terminal Sacrifice	16-MAR-04	3	14
1005	Terminal Sacrifice	16-MAR-04	3	14
1006	Terminal Sacrifice	16-MAR-04	3	14
1007	Terminal Sacrifice	16-MAR-04	3	14
1008	Terminal Sacrifice	16-MAR-04	3	14
1009	Terminal Sacrifice	16-MAR-04	3	14
1010	Terminal Sacrifice	16-MAR-04	3	14

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MALE

APPENDIX B

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

ANIMAL TERMINATION HISTORY

MALES GROUP 2 25 MG/M3

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	WEEK OF STUDY	STUDY DAY
2001	Terminal Sacrifice	16-MAR-04	3	14
2002	Terminal Sacrifice	16-MAR-04	3	14
2003	Terminal Sacrifice	16-MAR-04	3	14
2004	Terminal Sacrifice	16-MAR-04	3	14
2005	Terminal Sacrifice	16-MAR-04	3	14
2006	Terminal Sacrifice	16-MAR-04	3	14
2007	Terminal Sacrifice	16-MAR-04	3	14
2008	Terminal Sacrifice	16-MAR-04	3	14
2009	Terminal Sacrifice	16-MAR-04	3	14
2010	Terminal Sacrifice	16-MAR-04	3	14

Huntingdon Life Sciences 03-6147M
MALE

APPENDIX B

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

ANIMAL TERMINATION HISTORY

MALES GROUP 3 75 MG/M3

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	WEEK OF STUDY	STUDY DAY
3001	Terminal Sacrifice	16-MAR-04	3	14
3002	Terminal Sacrifice	16-MAR-04	3	14
3003	Terminal Sacrifice	16-MAR-04	3	14
3004	Terminal Sacrifice	16-MAR-04	3	14
3005	Terminal Sacrifice	16-MAR-04	3	14
3006	Terminal Sacrifice	16-MAR-04	3	14
3007	Terminal Sacrifice	16-MAR-04	3	14
3008	Terminal Sacrifice	16-MAR-04	3	14
3009	Terminal Sacrifice	16-MAR-04	3	14
3010	Terminal Sacrifice	16-MAR-04	3	14

Huntingdon Life Sciences 03-6147M
MALE

APPENDIX B

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

ANIMAL TERMINATION HISTORY

MALES GROUP 4 200 MG/M3

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	WEEK OF STUDY	STUDY DAY
4001	Terminal Sacrifice	16-MAR-04	3	14
4002	Terminal Sacrifice	16-MAR-04	3	14
4003	Terminal Sacrifice	16-MAR-04	3	14
4004	Terminal Sacrifice	16-MAR-04	3	14
4005	Terminal Sacrifice	16-MAR-04	3	14
4006	Terminal Sacrifice	16-MAR-04	3	14
4007	Terminal Sacrifice	16-MAR-04	3	14
4008	Terminal Sacrifice	16-MAR-04	3	14
4009	Terminal Sacrifice	16-MAR-04	3	14
4010	Terminal Sacrifice	16-MAR-04	3	14

Huntingdon Life Sciences 03-6147F
FEMALE

APPENDIX B

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

ANIMAL TERMINATION HISTORY

FEMALES GROUP 1 0 MG/M3

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	WEEK OF STUDY	STUDY DAY
1501	Terminal Sacrifice	17-MAR-04	3	14
1502	Terminal Sacrifice	17-MAR-04	3	14
1503	Terminal Sacrifice	17-MAR-04	3	14
1504	Terminal Sacrifice	17-MAR-04	3	14
1505	Terminal Sacrifice	17-MAR-04	3	14
1506	Terminal Sacrifice	17-MAR-04	3	14
1507	Terminal Sacrifice	17-MAR-04	3	14
1508	Terminal Sacrifice	17-MAR-04	3	14
1509	Terminal Sacrifice	17-MAR-04	3	14
1510	Terminal Sacrifice	17-MAR-04	3	14

Huntingdon Life Sciences 03-6147F
FEMALE

APPENDIX B

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

ANIMAL TERMINATION HISTORY

FEMALES GROUP 2 25 MG/M3

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	WEEK OF STUDY	STUDY DAY
2501	Terminal Sacrifice	17-MAR-04	3	14
2502	Terminal Sacrifice	17-MAR-04	3	14
2503	Terminal Sacrifice	17-MAR-04	3	14
2504	Terminal Sacrifice	17-MAR-04	3	14
2505	Terminal Sacrifice	17-MAR-04	3	14
2506	Terminal Sacrifice	17-MAR-04	3	14
2507	Terminal Sacrifice	17-MAR-04	3	14
2508	Terminal Sacrifice	17-MAR-04	3	14
2509	Terminal Sacrifice	17-MAR-04	3	14
2510	Terminal Sacrifice	17-MAR-04	3	14

Huntingdon Life Sciences 03-6147F
FEMALE

APPENDIX B

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

ANIMAL TERMINATION HISTORY

FEMALES GROUP 3 75 MG/M3

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	WEEK OF STUDY	STUDY DAY
3501	Terminal Sacrifice	17-MAR-04	3	14
3502	Terminal Sacrifice	17-MAR-04	3	14
3503	Terminal Sacrifice	17-MAR-04	3	14
3504	Terminal Sacrifice	17-MAR-04	3	14
3505	Terminal Sacrifice	17-MAR-04	3	14
3506	Terminal Sacrifice	17-MAR-04	3	14
3507	Terminal Sacrifice	17-MAR-04	3	14
3508	Terminal Sacrifice	17-MAR-04	3	14
3509	Terminal Sacrifice	17-MAR-04	3	14
3510	Terminal Sacrifice	17-MAR-04	3	14

Huntingdon Life Sciences 03-6147F
FEMALE

APPENDIX B

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

ANIMAL TERMINATION HISTORY

FEMALES GROUP 4 200 MG/M3

ANIMAL#	TYPE OF DEATH	DATE OF DEATH	WEEK OF STUDY	STUDY DAY
4501	Terminal Sacrifice	17-MAR-04	3	14
4502	Terminal Sacrifice	17-MAR-04	3	14
4503	Terminal Sacrifice	17-MAR-04	3	14
4504	Terminal Sacrifice	17-MAR-04	3	14
4505	Terminal Sacrifice	17-MAR-04	3	14
4506	Terminal Sacrifice	17-MAR-04	3	14
4507	Terminal Sacrifice	17-MAR-04	3	14
4508	Terminal Sacrifice	17-MAR-04	3	14
4509	Terminal Sacrifice	17-MAR-04	3	14
4510	Terminal Sacrifice	17-MAR-04	3	14

	Individual Clinical Observations Preface	Appendix C

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

Corresponding exposure levels for each group were as follows:

Group 1 - 0 mg/m^3
Group 2 - 25 mg/m^3
Group 3 - 75 mg/m^3
Group 4 - 200 mg/m^3

Huntingdon Life Sciences 03-6147M
MALE

APPENDIX C

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL CLINICAL OBSERVATIONS

MALES GROUP 1 0 MG/M3

ANIMAL#	OBSERVATIONS	DAY OF STUDY - 7	0	7	1 3	1 4
1001	WITHIN NORMAL LIMITS	P	P	P		
	Terminal Sacrifice					P
	ORAL/BUCCAL: Nasal Discharge - Red				P	
1002	WITHIN NORMAL LIMITS	P	P	P	P	
	Terminal Sacrifice					P
1003	WITHIN NORMAL LIMITS	P	P	P	P	
	Terminal Sacrifice					P
1004	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	OCULAR: Chromodacryorrhea - Unilateral			P	P	
	ORAL/BUCCAL: Nasal Discharge - Red			P	P	
1005	WITHIN NORMAL LIMITS	P	P	P	P	
	Terminal Sacrifice					P
1006	WITHIN NORMAL LIMITS	P	P	P	P	
	Terminal Sacrifice					P
1007	WITHIN NORMAL LIMITS	P	P	P	P	
	Terminal Sacrifice					P
1008	WITHIN NORMAL LIMITS	P	P	P	P	
	Terminal Sacrifice					P
1009	WITHIN NORMAL LIMITS	P	P		P	
	Terminal Sacrifice					P
	OCULAR: Chromodacryorrhea - Unilateral			P		
	ORAL/BUCCAL: Nasal Discharge - Red			P		

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

Huntingdon Life Sciences 03-6147M
MALE

APPENDIX C

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL CLINICAL OBSERVATIONS

MALES GROUP 1 0 MG/M3

ANIMAL#	OBSERVATIONS	DAY OF STUDY - 7	0	7	3	11 4
1010	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	ORAL/BUCCAL: Nasal Discharge - Red			P	P	

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

Huntingdon Life Sciences 03-6147M
MALE

APPENDIX C

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL CLINICAL OBSERVATIONS

MALES GROUP 2 25 MG/M3

ANIMAL#	OBSERVATIONS	DAY OF STUDY - 7	0	7	1 3	1 4
2001	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			1	1	
2002	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			1	1	
2003	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			1	1	
2004	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			1	1	
2005	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			1	1	
2006	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			1	1	
2007	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			1	1	
2008	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			1	1	

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

Huntingdon Life Sciences 03-6147M
MALE

APPENDIX C

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL CLINICAL OBSERVATIONS

MALES GROUP 2 25 MG/M3

ANIMAL#	OBSERVATIONS	DAY OF STUDY - 7	0	7	1 3	1 4
2009	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			1	1	
2010	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			1	1	

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

Huntingdon Life Sciences 03-6147M
MALE

APPENDIX C

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL CLINICAL OBSERVATIONS

MALES GROUP 3 75 MG/M3

ANIMAL#	OBSERVATIONS	DAY OF STUDY - 7	0	7	1 3	1 4
3001	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				1	1
	OCULAR: Chromodacryorrhea - Bilateral				P	
3002	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				1	1
3003	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				2	2
3004	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				2	1
3005	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				2	2
3006	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				2	2
	OCULAR: Chromodacryorrhea - Unilateral				P	
3007	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				1	1
3008	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				1	1

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

Huntingdon Life Sciences 03-6147M
MALE

APPENDIX C

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL CLINICAL OBSERVATIONS

MALES GROUP 3 75 MG/M3

ANIMAL#	OBSERVATIONS	DAY OF STUDY - 7	0	7	3	11 4
3009	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			2	1	
3010	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			2	2	

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

Huntingdon Life Sciences 03-6147M
MALE

APPENDIX C

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL CLINICAL OBSERVATIONS

MALES GROUP 4 200 MG/M3

ANIMAL#	OBSERVATIONS	DAY OF STUDY - 7	0	7	1 3	1 4
4001	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			3	3	
4002	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			3	3	
	OCULAR: Chromodacryorrhea - Bilateral			P		
4003	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			2	3	
4004	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			3	3	
4005	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			3	2	
4006	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			2	2	
4007	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			2	2	
4008	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			3	3	

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

Huntingdon Life Sciences 03-6147M
MALE

APPENDIX C

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL CLINICAL OBSERVATIONS

MALES GROUP 4 200 MG/M3

ANIMAL#	OBSERVATIONS	DAY OF STUDY - 7	0	7	1 3	1 4
4009	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				3	3
4010	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				2	2

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

Huntingdon Life Sciences 03-6147F
FEMALE

APPENDIX C

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL CLINICAL OBSERVATIONS

FEMALES GROUP 1 0 MG/M3

ANIMAL#	OBSERVATIONS	DAY OF STUDY - 8	0	7	3	11 4
1501	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	OCULAR: Chromodacryorrhea - Unilateral			P	P	
1502	WITHIN NORMAL LIMITS	P	P	P	P	
	Terminal Sacrifice					P
1503	WITHIN NORMAL LIMITS	P	P	P	P	
	Terminal Sacrifice					P
1504	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	OCULAR: Chromodacryorrhea - Unilateral			P	P	
1505	WITHIN NORMAL LIMITS	P	P	P	P	
	Terminal Sacrifice					P
1506	WITHIN NORMAL LIMITS	P	P	P	P	
	Terminal Sacrifice					P
1507	WITHIN NORMAL LIMITS	P	P	P	P	
	Terminal Sacrifice					P
1508	WITHIN NORMAL LIMITS	P	P	P	P	
	Terminal Sacrifice					P
1509	WITHIN NORMAL LIMITS	P	P	P	P	
	Terminal Sacrifice					P
1510	WITHIN NORMAL LIMITS	P	P	P	P	
	Terminal Sacrifice					P

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

Huntingdon Life Sciences 03-6147F
FEMALE

APPENDIX C

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL CLINICAL OBSERVATIONS

FEMALES GROUP 2 25 MG/M3

ANIMAL#	OBSERVATIONS	DAY OF STUDY - 8	0	7	1 3	1 4
2501	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				1	1
2502	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				1	1
2503	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				1	1
2504	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				1	1
2505	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				1	1
2506	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				1	1
2507	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				1	1
2508	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				1	1

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

Huntingdon Life Sciences 03-6147F
FEMALE

APPENDIX C

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL CLINICAL OBSERVATIONS

FEMALES GROUP 2 25 MG/M3

ANIMAL#	OBSERVATIONS	DAY OF STUDY - 8	0	7	1 3	1 4
2509	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				1	1
2510	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				1	1

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

Huntingdon Life Sciences 03-6147F
FEMALE

APPENDIX C

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL CLINICAL OBSERVATIONS

FEMALES GROUP 3 75 MG/M3

ANIMAL#	OBSERVATIONS	DAY OF STUDY - 8	0	7	3	4
3501	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			1	1	
3502	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			2	2	
3503	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			2	1	
3504	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			1	1	
3505	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			1	1	
3506	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			1	2	
3507	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			1	1	
3508	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			2	2	

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

Huntingdon Life Sciences 03-6147F
FEMALE

APPENDIX C

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL CLINICAL OBSERVATIONS

FEMALES GROUP 3 75 MG/M3

ANIMAL#	OBSERVATIONS	DAY OF STUDY - 8	0	7	3	11 4
3509	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			1	1	
	OCULAR: Chromodacryorrhea - Bilateral			P		
3510	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			1	1	

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

Huntingdon Life Sciences 03-6147F
FEMALE

APPENDIX C

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL CLINICAL OBSERVATIONS

FEMALES GROUP 4 200 MG/M3

ANIMAL#	OBSERVATIONS	DAY OF STUDY - 8	0	7	3	11 4
4501	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				3	3
4502	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				3	3
4503	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				2	2
4504	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				2	3
4505	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				2	2
	OCULAR: Chromodacryorrhea - Bilateral				P	
4506	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				3	3
4507	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				2	2
4508	WITHIN NORMAL LIMITS	P	P			
	Terminal Sacrifice					P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)				2	2

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

Huntingdon Life Sciences 03-6147F
FEMALE

APPENDIX C

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL CLINICAL OBSERVATIONS

FEMALES GROUP 4 200 MG/M3

ANIMAL#	OBSERVATIONS	DAY OF STUDY - 8	0	7	3	1 4	1
4509	WITHIN NORMAL LIMITS	P	P				
	Terminal Sacrifice						P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			2	2		
	OCULAR: Chromodacryorrhea - Unilateral			P	P		
4510	WITHIN NORMAL LIMITS	P	P				
	Terminal Sacrifice						P
	APPEARANCE: TEST MATERIAL ON FUR (BLACK)			2	2		

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

Huntingdon Life Sciences 03-6147M
MALE

APPENDIX D

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL BODY WEIGHTS (GRAMS)

MALES GROUP 1 0 MG/M3

	DAY OF STUDY			
ANIMAL#	-7	0	7	13
1001	212	282	326	353
1002	189	255	294	325
1003	208	272	301	319
1004	201	260	300	328
1005	199	256	282	304
1006	194	260	280	299
1007	204	283	318	350
1008	209	274	300	332
1009	196	250	284	310
1010	192	254	281	305
MEAN	200	264	296	323
S.D.	7.7	12.1	15.7	19.0
N	10	10	10	10

Huntingdon Life Sciences 03-6147M
MALE

APPENDIX D

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL BODY WEIGHTS (GRAMS)

MALES GROUP 2 25 MG/M3

	DAY OF STUDY			
ANIMAL#	-7	0	7	13
2001	211	272	310	344
2002	202	269	306	334
2003	209	281	310	345
2004	190	254	272	301
2005	200	266	308	340
2006	198	256	282	301
2007	193	257	291	318
2008	192	258	287	310
2009	204	266	271	288
2010	207	271	316	359
MEAN	200	265	295	324
S.D.	7.3	8.8	16.6	23.5
N	10	10	10	10

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MALE

APPENDIX D

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL BODY WEIGHTS (GRAMS)

MALES GROUP 3 75 MG/M3

	DAY OF STUDY			
ANIMAL#	-7	0	7	13
3001	202	266	299	323
3002	206	257	297	333
3003	215	287	330	357
3004	189	252	280	303
3005	209	273	294	317
3006	194	259	273	302
3007	193	265	303	330
3008	197	262	292	332
3009	199	270	314	351
3010	203	273	295	331
MEAN	201	266	298	328
S.D.	7.9	9.9	15.9	17.9
N	10	10	10	10

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MALE

APPENDIX D

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL BODY WEIGHTS (GRAMS)

MALES GROUP 4 200 MG/M3

	DAY OF STUDY			
ANIMAL#	-7	0	7	13
4001	206	269	304	336
4002	204	263	286	320
4003	187	247	279	313
4004	216	285	321	359
4005	196	252	282	315
4006	202	269	290	316
4007	196	268	298	326
4008	210	275	305	336
4009	198	262	292	327
4010	192	255	279	306
MEAN	201	264	294	325
S.D.	8.6	11.3	13.5	15.4
N	10	10	10	10

Huntingdon Life Sciences 03-6147F
FEMALE

APPENDIX D

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL BODY WEIGHTS (GRAMS)

FEMALES GROUP 1 0 MG/M3

	DAY OF STUDY			
ANIMAL#	-8	0	7	13
1501	186	216	231	252
1502	172	209	206	215
1503	160	191	209	227
1504	177	213	232	242
1505	179	211	228	233
1506	164	198	220	226
1507	169	203	235	241
1508	170	214	231	234
1509	175	221	219	241
1510	181	218	227	249
MEAN	173	210	224	236
S.D.	7.8	9.4	10.0	11.2
N	10	10	10	10

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FEMALE

APPENDIX D

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL BODY WEIGHTS (GRAMS)

FEMALES GROUP 2 25 MG/M3

	DAY OF STUDY			
ANIMAL#	-8	0	7	13
2501	178	215	225	232
2502	173	210	215	233
2503	174	188	208	217
2504	179	215	231	246
2505	161	193	203	218
2506	179	219	229	243
2507	167	206	228	225
2508	163	205	207	229
2509	186	220	238	252
2510	170	208	212	226
MEAN	173	208	219	232
S.D.	7.8	10.5	12.0	11.6
N	10	10	10	10

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FEMALE

APPENDIX D

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL BODY WEIGHTS (GRAMS)

FEMALES GROUP 3 75 MG/M3

	DAY OF STUDY			
ANIMAL#	-8	0	7	13
3501	182	220	232	244
3502	165	183	208	205
3503	170	202	215	230
3504	173	211	218	238
3505	161	191	200	207
3506	166	201	213	221
3507	171	206	221	219
3508	176	218	239	251
3509	185	225	235	246
3510	178	221	235	249
MEAN	173	208	221	231
S.D.	7.8	13.9	13.2	17.1
N	10	10	10	10

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FEMALE

APPENDIX D

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL BODY WEIGHTS (GRAMS)

FEMALES GROUP 4 200 MG/M3

	DAY OF STUDY			
ANIMAL#	-8	0	7	13
4501	170	209	213	230
4502	185	215	239	244
4503	172	204	206	223
4504	183	225	240	252
4505	169	199	223	233
4506	176	220	229	242
4507	166	205	203	218
4508	162	197	215	216
4509	178	217	226	250
4510	174	209	227	242
MEAN	173	210	222	235
S.D.	7.3	9.2	12.8	13.1
N	10	10	10	10

Huntingdon Life Sciences 03-6147M
MALE

APPENDIX E

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL BODY WEIGHT CHANGE FROM BASELINE (GRAMS)

MALES GROUP 1 0 MG/M3

	DAY OF STUDY	
ANIMAL#	0-7	0-13
1001	44	72
1002	39	70
1003	29	48
1004	40	68
1005	26	48
1006	21	39
1007	35	68
1008	26	58
1009	34	60
1010	27	52
MEAN	32	58
S.D.	7.4	11.2
N	10	10

Huntingdon Life Sciences 03-6147M
MALE

APPENDIX E

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL BODY WEIGHT CHANGE FROM BASELINE (GRAMS)

MALES GROUP 2 25 MG/M3

	DAY OF STUDY	
ANIMAL#	0-7	0-13
2001	37	72
2002	37	65
2003	29	64
2004	18	48
2005	42	73
2006	26	45
2007	34	61
2008	29	52
2009	6	22
2010	45	88
MEAN	30	59
S.D.	11.7	18.2
N	10	10

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MALE

APPENDIX E

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL BODY WEIGHT CHANGE FROM BASELINE (GRAMS)

MALES GROUP 3 75 MG/M3

ANIMAL#	DAY 0-7	OF STUDY 0-13
3001	33	57
3002	39	76
3003	43	70
3004	27	51
3005	21	44
3006	14	43
3007	38	64
3008	31	71
3009	44	82
3010	22	58
MEAN	31	61
S.D.	10.0	13.2
N	10	10

Huntingdon Life Sciences 03-6147M
MALE

APPENDIX E

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL BODY WEIGHT CHANGE FROM BASELINE (GRAMS)

MALES GROUP 4 200 MG/M3

ANIMAL#	DAY 0-7	OF STUDY 0-13
4001	35	67
4002	23	57
4003	32	66
4004	36	74
4005	30	63
4006	21	47
4007	30	59
4008	30	61
4009	30	66
4010	24	50
MEAN	29	61
S.D.	5.0	8.0
N	10	10

Huntingdon Life Sciences 03-6147F
FEMALE

APPENDIX E

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL BODY WEIGHT CHANGE FROM BASELINE (GRAMS)

FEMALES GROUP 1 0 MG/M3

	DAY OF STUDY	
ANIMAL#	0-7	0-13
1501	15	35
1502	-3	6
1503	18	36
1504	19	29
1505	17	22
1506	21	27
1507	32	38
1508	17	20
1509	-2	20
1510	9	31
MEAN	14	26
S.D.	10.5	9.7
N	10	10

Huntingdon Life Sciences 03-6147F
FEMALE

APPENDIX E

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL BODY WEIGHT CHANGE FROM BASELINE (GRAMS)

FEMALES GROUP 2 25 MG/M3

ANIMAL#	DAY 0-7	OF STUDY 0-13
2501	10	17
2502	6	24
2503	19	29
2504	16	31
2505	10	25
2506	9	24
2507	22	19
2508	2	24
2509	18	32
2510	3	18
MEAN	11	24
S.D.	6.9	5.2
N	10	10

Huntingdon Life Sciences 03-6147F
FEMALE

APPENDIX E

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL BODY WEIGHT CHANGE FROM BASELINE (GRAMS)

FEMALES GROUP 3 75 MG/M3

ANIMAL#	DAY 0-7	OF STUDY 0-13
3501	13	25
3502	25	23
3503	13	29
3504	7	27
3505	9	17
3506	12	21
3507	15	13
3508	21	33
3509	10	21
3510	14	28
MEAN	14	24
S.D.	5.5	6.1
N	10	10

Huntingdon Life Sciences 03-6147F
FEMALE

APPENDIX E

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL BODY WEIGHT CHANGE FROM BASELINE (GRAMS)

FEMALES GROUP 4 200 MG/M3

	DAY OF STUDY	
ANIMAL#	0-7	0-13
4501	3	21
4502	23	29
4503	2	19
4504	15	27
4505	25	35
4506	9	22
4507	-3	12
4508	18	19
4509	9	33
4510	18	33
MEAN	12	25
S.D.	9.3	7.5
N	10	10

Huntingdon Life Sciences 03-6147M
MALE

APPENDIX F

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL FEED CONSUMPTION VALUES (GRAMS/KG/DAY)

MALES GROUP 1 0 MG/M3

	DAY OF STUDY		
ANIMAL#	0	7	13
1001	111	89	84
1002	111	92	83
1003	103	87	79
1004	104	91	83
1005	108	85	82
1006	112	86	77
1007	110	89	81
1008	104	80	78
1009	106	88	76
1010	106	89	79
MEAN	107	87	80
S.D.	3.1	3.4	2.8
N	10	10	10

Huntingdon Life Sciences 03-6147M
MALE

APPENDIX F

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL FEED CONSUMPTION VALUES (GRAMS/KG/DAY)

MALES GROUP 2 25 MG/M3

	DAY OF STUDY		
ANIMAL#	0	7	13
2001	111	88	80
2002	107	85	78
2003	109	89	85
2004	110	90	85
2005	114	92	86
2006	106	81	74
2007	105	83	78
2008	106	83	75
2009	108	86	75
2010	110	89	86
MEAN	109	87	80
S.D.	2.8	3.6	4.9
N	10	10	10

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MALE

APPENDIX F

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL FEED CONSUMPTION VALUES (GRAMS/KG/DAY)

MALES GROUP 3 75 MG/M3

	DAY OF STUDY		
ANIMAL#	0	7	13
3001	105	91	79
3002	101	84	80
3003	114	90	81
3004	112	75	77
3005	112	93	81
3006	108	87	79
3007	115	95	82
3008	108	85	83
3009	118	95	88
3010	117	89	83
MEAN	111	88	81
S.D.	5.5	6.0	3.0
N	10	10	10

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MALE

APPENDIX F

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL FEED CONSUMPTION VALUES (GRAMS/KG/DAY)

MALES GROUP 4 200 MG/M3

	DAY OF STUDY		
ANIMAL#	0	7	13
4001	107	69	77
4002	105	87	78
4003	107	93	78
4004	114	77	82
4005	105	85	79
4006	110	84	77
4007	116	90	81
4008	109	85	80
4009	114	84	80
4010	108	86	81
MEAN	109	84	79
S.D.	3.7	6.5	1.8
N	10	10	10

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APPENDIX F

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL FEED CONSUMPTION VALUES (GRAMS/KG/DAY)

FEMALES GROUP 1 0 MG/M3

	DAY OF STUDY		
ANIMAL#	0	7	13
1501	100	84	79
1502	111	83	88
1503	96	80	84
1504	103	84	81
1505	101	87	81
1506	103	88	78
1507	99	88	71
1508	98	84	86
1509	106	76	82
1510	97	82	97
MEAN	101	84	83
S.D.	4.6	3.6	6.9
N	10	10	10

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FEMALE

APPENDIX F

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL FEED CONSUMPTION VALUES (GRAMS/KG/DAY)

FEMALES GROUP 2 25 MG/M3

	DAY OF STUDY		
ANIMAL#	0	7	13
2501	103	86	82
2502	103	82	80
2503	96	89	85
2504	99	83	81
2505	102	84	80
2506	97	80	77
2507	103	87	77
2508	102	81	85
2509	98	87	80
2510	108	86	86
MEAN	101	84	81
S.D.	3.5	2.8	3.2
N	10	10	10

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FEMALE

APPENDIX F

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL FEED CONSUMPTION VALUES (GRAMS/KG/DAY)

FEMALES GROUP 3 75 MG/M3

	DAY OF STUDY		
ANIMAL#	0	7	13
3501	110	86	81
3502	96	86	74
3503	97	81	80
3504	99	83	83
3505	106	86	81
3506	106	89	89
3507	99	82	72
3508	SF	87	81
3509	98	80	77
3510	112	89	91
MEAN	103	85	81
S.D.	6.1	3.4	5.9
N	9	10	10

SF=Spilled Feeder

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FEMALE

APPENDIX F

PETROLEUM COKE: A 2-WEEK RANGE-FINDING INHALATION TOXICITY
STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

INDIVIDUAL FEED CONSUMPTION VALUES (GRAMS/KG/DAY)

FEMALES GROUP 4 200 MG/M3

	DAY OF STUDY		
ANIMAL#	0	7	13
4501	101	77	78
4502	95	83	78
4503	99	78	83
4504	104	82	83
4505	103	95	80
4506	105	80	75
4507	SF	90	89
4508	104	86	79
4509	103	81	82
4510	102	82	78
MEAN	102	83	80
S.D.	3.0	5.5	3.7
N	9	10	10

SF=Spilled Feeder

	Individual Organ Weights Preface	Appendix G

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Key to Abbreviations:

g	=	Grams
wt.	=	Weight
observ.	=	Observed
semis w/prostate	=	Seminal vesicles

Corresponding exposure levels for each group were as follows:

Group 1 - 0 mg/m^3
Group 2 - 25 mg/m^3
Group 3 - 75 mg/m^3
Group 4 - 200 mg/m^3

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Animal No/sex	Group/ Subgroup	Terminal Body wt. (g)	Adrenal Glands	Brain	Epididymides	Heart	Kidneys	Liver
				Male Animals				
1001/M	1/1	319.9	0.0483	1.9702	0.7815	1.3678	2.7428	11.4664
1002/M	1/1	289.7	0.0485	1.9484	0.7857	1.1685	2.8161	9.9746
1003/M	1/1	284.7	0.0591	1.9523	0.8559	1.2251	2.7197	9.8338
1004/M	1/1	292.5	0.0634	1.8570	0.8648	1.0429	2.7511	11.3922
1005/M	1/1	270.6	0.0573	1.8250	0.8472	1.0093	2.6815	9.4910
1006/M	1/1	269.7	0.0562	1.9231	0.8116	1.1294	2.5673	9.7831
1007/M	1/1	317.2	0.0648	2.0252	0.9830	1.2111	2.9328	12.5442
1008/M	1/1	297.4	0.0565	1.9485	0.7584	1.1514	3.0385	9.5198
1009/M	1/1	274.0	0.0592	1.8527	0.7753	1.1733	2.7526	10.4491
1010/M	1/1	275.5	0.0673	1.9790	0.9086	1.2252	2.7236	12.0753
Mean:		289.1	0.0581	1.9281	0.8372	1.1704	2.7726	10.6530
Standard deviation:		18.2	0.0063	0.0638	0.0699	0.1005	0.1315	1.1241
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
2001/M	2/1	307.7	0.0565	1.8802	0.8161	1.3126	2.8686	9.7683
2002/M	2/1	296.5	0.0546	1.8071	0.7225	1.2523	2.8587	10.1391
2003/M	2/1	304.1	0.0638	2.0010	1.0310	1.1720	3.0256	12.2180
2004/M	2/1	266.1	0.0688	1.9329	0.7587	1.2320	2.5344	11.8110
2005/M	2/1	305.0	0.0564	2.1437	0.7603	1.3025	2.6641	10.0299
2006/M	2/1	277.3	0.0707	2.0010	0.8984	0.9958	2.7864	11.8019
2007/M	2/1	282.1	0.0464	1.8279	0.6790	1.1066	2.6566	9.7740
2008/M	2/1	283.0	0.0553	1.9752	0.7994	1.2010	2.8097	11.5908
2009/M	2/1	257.5	0.0504	1.9694	0.7658	1.0874	2.4795	9.1405
2010/M	2/1	321.9	0.0490	2.0168	0.7615	1.3761	3.2626	11.8207
Mean:		290.1	0.0572	1.9555	0.7993	1.2038	2.7946	10.8094
Standard deviation:		20.3	0.0082	0.0991	0.0999	0.1163	0.2322	1.1355
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
3001/M	3/1	288.5	0.0638	2.0269	0.8293	1.3570	2.7493	11.0853
3002/M	3/1	298.2	0.0586	1.9968	0.6986	1.1562	3.0225	11.3615
3003/M	3/1	320.1	0.0620	1.9338	0.9149	1.3818	3.0349	11.9704
3004/M	3/1	269.7	0.0545	1.8393	0.7296	1.1731	2.7165	9.4448
3005/M	3/1	286.5	0.0712	1.8501	0.8232	1.1369	2.9925	10.1998
3006/M	3/1	267.1	0.0522	1.8872	0.7999	1.0839	2.0783	8.7631
3007/M	3/1	294.1	0.0651	1.9698	0.8093	1.1039	2.7958	10.1832
3008/M	3/1	299.1	0.0651	1.9319	0.7704	1.1320	2.6381	9.3915
3009/M	3/1	310.4	0.0569	2.0017	0.8407	1.3304	3.1547	13.4816
3010/M	3/1	290.7	0.0626	2.0418	0.7731	1.1765	2.9583	11.7679
Mean:		292.4	0.0612	1.9479	0.7989	1.2032	2.8141	10.7649
Standard deviation:		16.3	0.0057	0.0717	0.0607	0.1101	0.3068	1.4373
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
4001/M	4/1	295.6	0.0485	2.0221	1.0172	1.2288	2.8610	10.3638
4002/M	4/1	285.5	0.0490	2.0007	0.7239	1.1409	3.0231	10.5756
4003/M	4/1	277.8	0.0528	1.8526	0.6584	1.1029	2.7404	10.7561

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Animal No/sex	Group/ Subgroup	Terminal Body wt. (g)	Adrenal Glands	Brain	Epididymides	Heart	Kidneys	Liver
4004/M	4/1	324.5	0.0572	1.8993	0.8614	1.2099	2.8718	11.1187
4005/M	4/1	280.8	0.0630	1.8464	0.7368	1.1570	2.8852	10.1000
4006/M	4/1	282.4	0.0450	1.9523	0.8467	1.2587	2.8700	9.4641
4007/M	4/1	292.0	0.0645	1.9403	0.7572	1.3398	2.9926	9.5035
4008/M	4/1	296.9	0.0689	2.1083	0.7363	1.2500	3.1054	11.6208
4009/M	4/1	293.9	0.0577	1.9761	0.6478	1.4293	3.2957	10.0765
4010/M	4/1	270.1	0.0625	1.9492	0.8721	1.1415	2.4401	10.9720
	M e a n:	290.0	0.0569	1.9547	0.7858	1.2259	2.9085	10.4551
Standard deviation:		14.9	0.0079	0.0790	0.1131	0.1003	0.2266	0.6942
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)

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Animal No/sex	Group/ Subgroup	Terminal Body wt. (g)	Lungs	Pituitary gland Semis w/prostate		Spleen	Testes	Thymus
				Male Animals				
1001/M	1/1	319.9	1.7015	0.0046	1.7575	0.5872	2.9025	0.4845
1002/M	1/1	289.7	1.5615	0.0053	1.6174	0.5887	2.8663	0.6950
1003/M	1/1	284.7	1.9086	0.0096	1.9744	0.6424	3.4313	0.5580
1004/M	1/1	292.5	1.6254	0.0047	1.5782	0.5342	2.7972	0.4445
1005/M	1/1	270.6	1.4905	0.0096	1.9836	0.5002	3.1518	0.4756
1006/M	1/1	269.7	1.4626	0.0087	1.3910	0.5839	3.0392	0.4441
1007/M	1/1	317.2	1.9929	0.0097	2.0149	0.7765	3.3883	0.5218
1008/M	1/1	297.4	2.0093	0.0073	2.1146	0.7378	2.9814	0.6412
1009/M	1/1	274.0	1.5259	0.0093	1.5538	0.5773	3.0579	0.5320
1010/M	1/1	275.5	1.7000	0.0098	1.5768	0.5774	3.0504	0.5151
Mean:		289.1	1.6978	0.0079	1.7562	0.6106	3.0666	0.5312
Standard deviation:		18.2	0.2055	0.0022	0.2477	0.0861	0.2086	0.0819
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
2001/M	2/1	307.7	1.9205	0.0110	1.9658	0.6080	2.9682	0.4684
2002/M	2/1	296.5	2.1707	0.0101	2.0448	0.6815	3.2605	0.4202
2003/M	2/1	304.1	2.1287	0.0092	1.9646	0.5843	3.4823	0.6125
2004/M	2/1	266.1	1.7765	0.0089	1.4767	0.5276	3.3298	0.4116
2005/M	2/1	305.0	1.9331	0.0085	1.5521	0.6841	3.1019	0.9421
2006/M	2/1	277.3	1.7262	0.0112	1.6409	0.5818	2.8876	0.5228
2007/M	2/1	282.1	1.9707	0.0103	1.8685	0.6275	3.2138	0.5578
2008/M	2/1	283.0	1.7326	0.0078	1.4486	0.6050	3.0633	0.4701
2009/M	2/1	257.5	1.6615	0.0103	1.8172	0.5971	3.1515	0.3972
2010/M	2/1	321.9	1.9464	0.0103	2.0566	0.7369	3.2743	0.4256
Mean:		290.1	1.8967	0.0098	1.7836	0.6234	3.1733	0.5228
Standard deviation:		20.3	0.1714	0.0011	0.2351	0.0612	0.1766	0.1629
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
3001/M	3/1	288.5	2.2566	0.0099	1.6828	0.6315	3.4864	0.5943
3002/M	3/1	298.2	1.7295	0.0100	2.0709	0.6905	2.3404	0.5828
3003/M	3/1	320.1	1.8999	0.0103	1.8616	0.7495	3.2302	0.5202
3004/M	3/1	269.7	1.5759	0.0112	1.9293	0.5662	3.1343	0.4806
3005/M	3/1	286.5	1.5930	0.0099	1.9271	0.5068	2.6688	0.4323
3006/M	3/1	267.1	1.7415	0.0071	1.9481	0.6907	3.1943	0.3665
3007/M	3/1	294.1	1.8114	0.0103	1.5435	0.5899	3.3833	0.4207
3008/M	3/1	299.1	2.2269	0.0095	2.0588	0.6273	3.0410	0.7622
3009/M	3/1	310.4	1.9685	0.0107	1.9368	0.6355	2.8372	0.5981
3010/M	3/1	290.7	2.3262	0.0106	1.6051	0.5860	2.9561	0.5117
Mean:		292.4	1.9129	0.0100	1.8564	0.6274	3.0272	0.5269
Standard deviation:		16.3	0.2749	0.0011	0.1836	0.0702	0.3431	0.1138
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
4001/M	4/1	295.6	2.0668	0.0098	2.0936	0.6022	3.5809	0.4691
4002/M	4/1	285.5	1.9108	0.0110	1.3814	0.6027	3.1258	0.5404
4003/M	4/1	277.8	1.7789	0.0100	1.5579	0.5268	2.6808	0.3823

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Animal No/sex	Group/ Subgroup	Terminal Body wt. (g)	Lungs	Pituitary gland Semis w/prostate		Spleen	Testes	Thymus
4004/M	4/1	324.5	2.0427	0.0107	1.5492	0.7050	3.0576	0.4650
4005/M	4/1	280.8	1.9301	0.0076	1.6691	0.5217	2.8036	0.5057
4006/M	4/1	282.4	1.8224	0.0098	1.6449	0.6120	3.2317	0.4105
4007/M	4/1	292.0	2.1308	0.0106	1.6724	0.6010	3.1275	0.4886
4008/M	4/1	296.9	1.9775	0.0100	2.1205	0.6415	3.3910	0.3713
4009/M	4/1	293.9	2.1594	0.0122	1.5137	0.7289	2.5908	0.6790
4010/M	4/1	270.1	2.0212	0.0107	1.6397	0.5668	2.9968	0.4719
	M e a n:	290.0	1.9841	0.0102	1.6842	0.6109	3.0587	0.4784
Standard deviation:		14.9	0.1249	0.0012	0.2396	0.0674	0.3078	0.0885
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)

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Animal No/sex	Group/ Subgroup	Terminal Body wt. (g)	Adrenal Glands	Brain	Heart	Kidneys	Liver	Lungs
				Female Animals				
1501/F	1/1	216.4	0.0733	1.9256	0.8082	2.0568	8.9642	1.5494
1502/F	1/1	192.8	0.0685	1.8550	0.7760	1.7264	6.4086	1.4773
1503/F	1/1	199.5	0.0540	1.9073	0.8332	1.7306	7.5774	1.6049
1504/F	1/1	211.8	0.0739	1.8245	0.8925	2.1670	8.3446	1.7314
1505/F	1/1	207.0	0.0781	1.8472	0.9006	1.8708	8.1067	1.4560
1506/F	1/1	201.6	0.0609	1.9368	0.8314	1.7686	6.7711	1.8556
1507/F	1/1	213.0	0.0597	1.8905	0.9473	2.0795	8.6789	1.4020
1508/F	1/1	215.5	0.0732	1.9265	0.9649	1.8715	7.3124	1.5231
1509/F	1/1	212.7	0.0814	1.9784	0.9114	2.0077	8.6891	1.7594
1510/F	1/1	220.8	0.0705	1.7814	0.9501	1.9902	7.9233	1.3551
Mean:		209.1	0.0694	1.8873	0.8816	1.9269	7.8776	1.5714
Standard deviation:		8.7	0.0087	0.0596	0.0656	0.1558	0.8528	0.1644
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
2501/F	2/1	208.7	0.0730	1.8548	0.9061	1.9257	8.9363	1.2013
2502/F	2/1	202.0	0.0598	1.9304	0.9302	1.7906	6.9470	1.7810
2503/F	2/1	191.6	0.0643	1.9385	0.8152	1.9775	8.1804	2.1710
2504/F	2/1	216.6	0.0677	1.7856	0.8920	1.8672	7.7409	1.3551
2505/F	2/1	191.7	0.0852	1.9719	0.8253	1.8099	8.5824	1.5479
2506/F	2/1	216.1	0.0712	1.9305	0.9790	1.8581	7.8610	1.2902
2507/F	2/1	201.3	0.0886	1.7554	0.7387	1.9166	8.0896	1.3941
2508/F	2/1	202.0	0.0645	1.8879	0.8396	1.8661	8.1836	1.1513
2509/F	2/1	223.8	0.0746	1.9046	0.8805	2.2801	9.5625	1.4577
2510/F	2/1	198.5	0.0786	1.8613	0.8626	1.9007	8.3988	1.4771
Mean:		205.2	0.0728	1.8821	0.8669	1.9193	8.2483	1.4827
Standard deviation:		10.8	0.0093	0.0691	0.0671	0.1382	0.7047	0.3014
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
3501/F	3/1	216.2	0.0885	1.7875	0.8539	1.9564	7.5783	1.3805
3502/F	3/1	183.3	0.0587	1.9492	0.7960	1.7185	7.7056	1.5555
3503/F	3/1	196.1	0.0808	1.8980	0.8636	1.8273	7.3667	1.5994
3504/F	3/1	211.3	0.0745	1.8537	1.0043	2.2285	7.7690	1.5799
3505/F	3/1	182.0	0.0732	1.9004	0.7862	1.5515	6.4190	1.4767
3506/F	3/1	190.2	0.0572	1.8393	0.8330	1.7416	6.9452	1.0789
3507/F	3/1	197.9	0.0689	1.8547	0.8533	1.6886	7.9822	1.1752
3508/F	3/1	222.0	0.0862	1.7666	1.1726	2.2474	7.5411	1.6918
3509/F	3/1	215.7	0.0854	1.8640	0.7837	1.7643	9.3634	1.8732
3510/F	3/1	220.6	0.0725	1.9184	0.8995	2.0125	9.8290	1.9818
Mean:		203.5	0.0746	1.8632	0.8846	1.8737	7.8500	1.5393
Standard deviation:		15.4	0.0109	0.0566	0.1203	0.2322	1.0285	0.2808
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
4501/F	4/1	202.7	0.0635	1.8321	0.8716	2.0195	7.5482	1.6305
4502/F	4/1	215.6	0.0719	1.9013	0.8688	2.1228	7.9559	1.6655
4503/F	4/1	195.0	0.0734	1.8931	0.7894	1.7643	7.4212	1.6838

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4504/F	4/1	221.6	0.0830	1.8545	0.9706	1.9654	8.1005	2.0181
4505/F	4/1	204.4	0.0727	1.8745	0.8429	1.9510	8.4828	1.9099
4506/F	4/1	216.7	0.0826	1.8396	0.9670	2.0389	8.8171	2.1384
4507/F	4/1	194.9	0.0680	1.7962	0.8557	1.9784	7.7237	1.7397
4508/F	4/1	193.8	0.0817	1.7975	0.8487	1.8827	8.4980	1.5245
4509/F	4/1	217.5	0.0738	1.7461	0.9466	1.7271	7.0907	1.7581
4510/F	4/1	210.2	0.0676	1.8769	0.7619	1.9916	7.6431	1.6146
	M e a n:	207.2	0.0738	1.8412	0.8723	1.9442	7.9281	1.7683
Standard deviation:		10.5	0.0067	0.0494	0.0706	0.1219	0.5456	0.1944
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)

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Animal No/sex	Group/ Subgroup	Terminal Body wt. (g)	Ovaries	Pituitary gland	Spleen	Thymus	Uterus
				Female Animals			
1501/F	1/1	216.4	0.1447	0.0122	0.5789	0.6601	0.7803
1502/F	1/1	192.8	0.0807	0.0065	0.5035	0.5820	0.4327
1503/F	1/1	199.5	0.0879	0.0111	0.5091	0.5129	0.5948
1504/F	1/1	211.8	0.1015	0.0129	0.6089	0.4232	0.4134
1505/F	1/1	207.0	0.0843	0.0143	0.4698	0.5460	0.5785
1506/F	1/1	201.6	0.0788	0.0108	0.4855	0.6241	0.5051
1507/F	1/1	213.0	0.0970	0.0154	0.5491	0.6274	0.7908
1508/F	1/1	215.5	0.0931	0.0149	0.4812	0.4714	0.4595
1509/F	1/1	212.7	0.0946	0.0129	0.5459	0.7104	0.8568
1510/F	1/1	220.8	0.0909	0.0078	0.4387	0.4183	0.5858
Mean:		209.1	0.0954	0.0119	0.5171	0.5576	0.5998
Standard deviation:		8.7	0.0188	0.0029	0.0527	0.1004	0.1589
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)
2501/F	2/1	208.7	0.0934	0.0146	0.4447	0.6002	0.4783
2502/F	2/1	202.0	0.0793	0.0134	0.4697	0.5425	0.6289
2503/F	2/1	191.6	0.0846	0.0139	0.5807	0.4267	0.4599
2504/F	2/1	216.6	0.0819	0.0145	0.5153	0.4247	0.5259
2505/F	2/1	191.7	0.0855	0.0142	0.3968	0.5428	0.7475
2506/F	2/1	216.1	0.0914	0.0131	0.4845	0.4685	0.4450
2507/F	2/1	201.3	0.0965	0.0136	0.4010	0.5492	0.4832
2508/F	2/1	202.0	0.0728	0.0151	0.5728	0.5289	1.0848
2509/F	2/1	223.8	0.0922	0.0139	0.5679	0.6584	0.6500
2510/F	2/1	198.5	0.1040	0.0139	0.4511	0.4466	0.5462
Mean:		205.2	0.0882	0.0140	0.4885	0.5189	0.6050
Standard deviation:		10.8	0.0091	0.0006	0.0686	0.0770	0.1945
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)
3501/F	3/1	216.2	0.0838	0.0156	0.5699	0.5318	0.8410
3502/F	3/1	183.3	0.0637	0.0161	0.3780	0.4403	0.5046
3503/F	3/1	196.1	0.0791	0.0147	0.4436	0.5226	0.7185
3504/F	3/1	211.3	0.0928	0.0141	0.5527	0.5258	0.4789
3505/F	3/1	182.0	0.0799	0.0114	0.4106	0.3517	0.5053
3506/F	3/1	190.2	0.0725	0.0101	0.5087	0.5955	0.5486
3507/F	3/1	197.9	0.0880	0.0117	0.4865	0.5323	0.3859
3508/F	3/1	222.0	0.0631	0.0124	0.5775	0.7038	0.5065
3509/F	3/1	215.7	0.0835	0.0131	0.4253	0.4497	0.5972
3510/F	3/1	220.6	0.0937	0.0141	0.5487	0.4782	0.8264
Mean:		203.5	0.0800	0.0133	0.4902	0.5132	0.5913
Standard deviation:		15.4	0.0108	0.0019	0.0722	0.0947	0.1537
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)
4501/F	4/1	202.7	0.0938	0.0159	0.4136	0.4640	0.7863
4502/F	4/1	215.6	0.1096	0.0112	0.4537	0.4900	0.4369
4503/F	4/1	195.0	0.0905	0.0142	0.4940	0.5796	0.7365

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Animal No/sex	Group/ Subgroup	Terminal Body wt. (g)	Ovaries	Pituitary gland	Spleen	Thymus	Uterus
4504/F	4/1	221.6	0.1122	0.0148	0.6962	0.4619	0.6759
4505/F	4/1	204.4	0.1069	0.0122	0.5134	0.6419	0.6175
4506/F	4/1	216.7	0.0696	0.0144	0.7022	0.5882	0.4913
4507/F	4/1	194.9	0.0983	0.0097	0.4728	0.5084	0.5509
4508/F	4/1	193.8	0.0889	0.0121	0.4526	0.2807	0.4589
4509/F	4/1	217.5	0.0919	0.0109	0.4930	0.4558	0.9857
4510/F	4/1	210.2	0.1044	0.0001	0.5573	0.4812	1.0426
M e a n:		207.2	0.0966	0.0116	0.5249	0.4952	0.6783
Standard deviation:		10.5	0.0126	0.0045	0.0996	0.0985	0.2118
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)

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Animal No/sex	Group/ Subgroup	Terminal Body wt. (g)	Adrenal Glands	Brain	Epididymides	Heart	Kidneys	Liver
				Male Animals				
1001/M	1/1	319.9	0.0151	0.6159	0.2443	0.4276	0.8574	3.5844
1002/M	1/1	289.7	0.0167	0.6726	0.2712	0.4033	0.9721	3.4431
1003/M	1/1	284.7	0.0208	0.6857	0.3006	0.4303	0.9553	3.4541
1004/M	1/1	292.5	0.0217	0.6349	0.2957	0.3565	0.9405	3.8948
1005/M	1/1	270.6	0.0212	0.6744	0.3131	0.3730	0.9909	3.5074
1006/M	1/1	269.7	0.0208	0.7131	0.3009	0.4188	0.9519	3.6274
1007/M	1/1	317.2	0.0204	0.6385	0.3099	0.3818	0.9246	3.9547
1008/M	1/1	297.4	0.0190	0.6552	0.2550	0.3872	1.0217	3.2010
1009/M	1/1	274.0	0.0216	0.6762	0.2830	0.4282	1.0046	3.8135
1010/M	1/1	275.5	0.0244	0.7183	0.3298	0.4447	0.9886	4.3830
Mean:		289.1	0.0202	0.6685	0.2903	0.4051	0.9608	3.6863
Standard deviation:		18.2	0.0026	0.0331	0.0269	0.0292	0.0471	0.3353
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
2001/M	2/1	307.7	0.0184	0.6110	0.2652	0.4266	0.9323	3.1746
2002/M	2/1	296.5	0.0184	0.6095	0.2437	0.4224	0.9641	3.4196
2003/M	2/1	304.1	0.0210	0.6580	0.3390	0.3854	0.9949	4.0178
2004/M	2/1	266.1	0.0259	0.7264	0.2851	0.4630	0.9524	4.4386
2005/M	2/1	305.0	0.0185	0.7029	0.2493	0.4270	0.8735	3.2885
2006/M	2/1	277.3	0.0255	0.7216	0.3240	0.3591	1.0048	4.2560
2007/M	2/1	282.1	0.0164	0.6480	0.2407	0.3923	0.9417	3.4647
2008/M	2/1	283.0	0.0195	0.6980	0.2825	0.4244	0.9928	4.0957
2009/M	2/1	257.5	0.0196	0.7648	0.2974	0.4223	0.9629	3.5497
2010/M	2/1	321.9	0.0152	0.6265	0.2366	0.4275	1.0135	3.6722
Mean:		290.1	0.0198	0.6767	0.2763	0.4150	0.9633	3.7377
Standard deviation:		20.3	0.0035	0.0537	0.0358	0.0288	0.0418	0.4347
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
3001/M	3/1	288.5	0.0221	0.7026	0.2875	0.4704	0.9530	3.8424
3002/M	3/1	298.2	0.0197	0.6696	0.2343	0.3877	1.0136	3.8100
3003/M	3/1	320.1	0.0194	0.6041	0.2858	0.4317	0.9481	3.7396
3004/M	3/1	269.7	0.0202	0.6820	0.2705	0.4350	1.0072	3.5020
3005/M	3/1	286.5	0.0249	0.6458	0.2873	0.3968	1.0445	3.5601
3006/M	3/1	267.1	0.0195	0.7066	0.2995	0.4058	0.7781	3.2808
3007/M	3/1	294.1	0.0221	0.6698	0.2752	0.3753	0.9506	3.4625
3008/M	3/1	299.1	0.0218	0.6459	0.2576	0.3785	0.8820	3.1399
3009/M	3/1	310.4	0.0183	0.6449	0.2708	0.4286	1.0163	4.3433
3010/M	3/1	290.7	0.0215	0.7024	0.2659	0.4047	1.0176	4.0481
Mean:		292.4	0.0210	0.6674	0.2734	0.4114	0.9611	3.6729
Standard deviation:		16.3	0.0019	0.0328	0.0185	0.0298	0.0804	0.3600
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
4001/M	4/1	295.6	0.0164	0.6841	0.3441	0.4157	0.9679	3.5060
4002/M	4/1	285.5	0.0172	0.7008	0.2536	0.3996	1.0589	3.7042
4003/M	4/1	277.8	0.0190	0.6669	0.2370	0.3970	0.9865	3.8719

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Animal No/sex	Group/ Subgroup	Terminal Body wt. (g)	Adrenal Glands	Brain	Epididymides	Heart	Kidneys	Liver
4004/M	4/1	324.5	0.0176	0.5853	0.2655	0.3729	0.8850	3.4264
4005/M	4/1	280.8	0.0224	0.6575	0.2624	0.4120	1.0275	3.5969
4006/M	4/1	282.4	0.0159	0.6913	0.2998	0.4457	1.0163	3.3513
4007/M	4/1	292.0	0.0221	0.6645	0.2593	0.4588	1.0249	3.2546
4008/M	4/1	296.9	0.0232	0.7101	0.2480	0.4210	1.0459	3.9140
4009/M	4/1	293.9	0.0196	0.6724	0.2204	0.4863	1.1214	3.4285
4010/M	4/1	270.1	0.0231	0.7217	0.3229	0.4226	0.9034	4.0622
	M e a n:	290.0	0.0197	0.6755	0.2713	0.4232	1.0038	3.6116
Standard deviation:		14.9	0.0029	0.0379	0.0390	0.0329	0.0712	0.2677
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)

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Animal No/sex	Group/ Subgroup	Terminal Body wt. (g)	Lungs	Pituitary gland Semis w/prostate		Spleen	Testes	Thymus
				M a l e	A n i m a l s			
1001/M	1/1	319.9	0.5319	0.0014	0.5494	0.1836	0.9073	0.1515
1002/M	1/1	289.7	0.5390	0.0018	0.5583	0.2032	0.9894	0.2399
1003/M	1/1	284.7	0.6704	0.0034	0.6935	0.2256	1.2052	0.1960
1004/M	1/1	292.5	0.5557	0.0016	0.5396	0.1826	0.9563	0.1520
1005/M	1/1	270.6	0.5508	0.0035	0.7330	0.1848	1.1647	0.1758
1006/M	1/1	269.7	0.5423	0.0032	0.5158	0.2165	1.1269	0.1647
1007/M	1/1	317.2	0.6283	0.0031	0.6352	0.2448	1.0682	0.1645
1008/M	1/1	297.4	0.6756	0.0025	0.7110	0.2481	1.0025	0.2156
1009/M	1/1	274.0	0.5569	0.0034	0.5671	0.2107	1.1160	0.1942
1010/M	1/1	275.5	0.6171	0.0036	0.5723	0.2096	1.1072	0.1870
M e a n:		289.1	0.5868	0.0027	0.6075	0.2110	1.0644	0.1841
Standard deviation:		18.2	0.0557	0.0008	0.0791	0.0237	0.0967	0.0285
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
2001/M	2/1	307.7	0.6241	0.0036	0.6389	0.1976	0.9646	0.1522
2002/M	2/1	296.5	0.7321	0.0034	0.6896	0.2298	1.0997	0.1417
2003/M	2/1	304.1	0.7000	0.0030	0.6460	0.1921	1.1451	0.2014
2004/M	2/1	266.1	0.6676	0.0033	0.5549	0.1983	1.2513	0.1547
2005/M	2/1	305.0	0.6338	0.0028	0.5089	0.2243	1.0170	0.3089
2006/M	2/1	277.3	0.6225	0.0040	0.5917	0.2098	1.0413	0.1885
2007/M	2/1	282.1	0.6986	0.0037	0.6624	0.2224	1.1392	0.1977
2008/M	2/1	283.0	0.6122	0.0028	0.5119	0.2138	1.0824	0.1661
2009/M	2/1	257.5	0.6452	0.0040	0.7057	0.2319	1.2239	0.1543
2010/M	2/1	321.9	0.6047	0.0032	0.6389	0.2289	1.0172	0.1322
M e a n:		290.1	0.6541	0.0034	0.6149	0.2149	1.0982	0.1798
Standard deviation:		20.3	0.0434	0.0005	0.0701	0.0148	0.0929	0.0511
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
3001/M	3/1	288.5	0.7822	0.0034	0.5833	0.2189	1.2085	0.2060
3002/M	3/1	298.2	0.5800	0.0034	0.6945	0.2316	0.7848	0.1954
3003/M	3/1	320.1	0.5935	0.0032	0.5816	0.2341	1.0091	0.1625
3004/M	3/1	269.7	0.5843	0.0042	0.7154	0.2099	1.1621	0.1782
3005/M	3/1	286.5	0.5560	0.0035	0.6726	0.1769	0.9315	0.1509
3006/M	3/1	267.1	0.6520	0.0027	0.7294	0.2586	1.1959	0.1372
3007/M	3/1	294.1	0.6159	0.0035	0.5248	0.2006	1.1504	0.1430
3008/M	3/1	299.1	0.7445	0.0032	0.6883	0.2097	1.0167	0.2548
3009/M	3/1	310.4	0.6342	0.0034	0.6240	0.2047	0.9140	0.1927
3010/M	3/1	290.7	0.8002	0.0036	0.5522	0.2016	1.0169	0.1760
M e a n:		292.4	0.6543	0.0034	0.6366	0.2147	1.0390	0.1797
Standard deviation:		16.3	0.0891	0.0004	0.0729	0.0225	0.1393	0.0350
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
4001/M	4/1	295.6	0.6992	0.0033	0.7083	0.2037	1.2114	0.1587
4002/M	4/1	285.5	0.6693	0.0039	0.4839	0.2111	1.0949	0.1893
4003/M	4/1	277.8	0.6404	0.0036	0.5608	0.1896	0.9650	0.1376

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Animal No/sex	Group/ Subgroup	Terminal Body wt. (g)	Lungs	Pituitary gland	Semis w/prostate	Spleen	Testes	Thymus
4004/M	4/1	324.5	0.6295	0.0033	0.4774	0.2173	0.9422	0.1433
4005/M	4/1	280.8	0.6874	0.0027	0.5944	0.1858	0.9984	0.1801
4006/M	4/1	282.4	0.6453	0.0035	0.5825	0.2167	1.1444	0.1454
4007/M	4/1	292.0	0.7297	0.0036	0.5727	0.2058	1.0711	0.1673
4008/M	4/1	296.9	0.6660	0.0034	0.7142	0.2161	1.1421	0.1251
4009/M	4/1	293.9	0.7347	0.0042	0.5150	0.2480	0.8815	0.2310
4010/M	4/1	270.1	0.7483	0.0040	0.6071	0.2098	1.1095	0.1747
M e a n:		290.0	0.6850	0.0035	0.5816	0.2104	1.0561	0.1652
Standard deviation:		14.9	0.0421	0.0004	0.0815	0.0171	0.1049	0.0308
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)

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Animal No/sex	Group/ Subgroup	Terminal Body wt. (g)	Adrenal Glands	Brain	Heart	Kidneys	Liver	Lungs
				Female Animals				
1501/F	1/1	216.4	0.0339	0.8898	0.3735	0.9505	4.1424	0.7160
1502/F	1/1	192.8	0.0355	0.9621	0.4025	0.8954	3.3240	0.7662
1503/F	1/1	199.5	0.0271	0.9560	0.4176	0.8675	3.7982	0.8045
1504/F	1/1	211.8	0.0349	0.8614	0.4214	1.0231	3.9398	0.8175
1505/F	1/1	207.0	0.0377	0.8924	0.4351	0.9038	3.9163	0.7034
1506/F	1/1	201.6	0.0302	0.9607	0.4124	0.8773	3.3587	0.9204
1507/F	1/1	213.0	0.0280	0.8876	0.4447	0.9763	4.0746	0.6582
1508/F	1/1	215.5	0.0340	0.8940	0.4477	0.8684	3.3932	0.7068
1509/F	1/1	212.7	0.0383	0.9301	0.4285	0.9439	4.0851	0.8272
1510/F	1/1	220.8	0.0319	0.8068	0.4303	0.9014	3.5885	0.6137
Mean:		209.1	0.0331	0.9041	0.4214	0.9208	3.7621	0.7534
Standard deviation:		8.7	0.0038	0.0494	0.0219	0.0514	0.3205	0.0912
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
2501/F	2/1	208.7	0.0350	0.8887	0.4342	0.9227	4.2819	0.5756
2502/F	2/1	202.0	0.0296	0.9556	0.4605	0.8864	3.4391	0.8817
2503/F	2/1	191.6	0.0336	1.0117	0.4255	1.0321	4.2695	1.1331
2504/F	2/1	216.6	0.0313	0.8244	0.4118	0.8620	3.5738	0.6256
2505/F	2/1	191.7	0.0444	1.0286	0.4305	0.9441	4.4770	0.8075
2506/F	2/1	216.1	0.0329	0.8933	0.4530	0.8598	3.6377	0.5970
2507/F	2/1	201.3	0.0440	0.8720	0.3670	0.9521	4.0187	0.6925
2508/F	2/1	202.0	0.0319	0.9346	0.4156	0.9238	4.0513	0.5700
2509/F	2/1	223.8	0.0333	0.8510	0.3934	1.0188	4.2728	0.6513
2510/F	2/1	198.5	0.0396	0.9377	0.4346	0.9575	4.2311	0.7441
Mean:		205.2	0.0356	0.9198	0.4226	0.9360	4.0253	0.7278
Standard deviation:		10.8	0.0053	0.0666	0.0275	0.0586	0.3546	0.1755
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
3501/F	3/1	216.2	0.0409	0.8268	0.3950	0.9049	3.5052	0.6385
3502/F	3/1	183.3	0.0320	1.0634	0.4343	0.9375	4.2038	0.8486
3503/F	3/1	196.1	0.0412	0.9679	0.4404	0.9318	3.7566	0.8156
3504/F	3/1	211.3	0.0353	0.8773	0.4753	1.0547	3.6768	0.7477
3505/F	3/1	182.0	0.0402	1.0442	0.4320	0.8525	3.5269	0.8114
3506/F	3/1	190.2	0.0301	0.9670	0.4380	0.9157	3.6515	0.5672
3507/F	3/1	197.9	0.0348	0.9372	0.4312	0.8533	4.0335	0.5938
3508/F	3/1	222.0	0.0388	0.7958	0.5282	1.0123	3.3969	0.7621
3509/F	3/1	215.7	0.0396	0.8642	0.3633	0.8179	4.3409	0.8684
3510/F	3/1	220.6	0.0329	0.8696	0.4078	0.9123	4.4556	0.8984
Mean:		203.5	0.0366	0.9213	0.4345	0.9193	3.8548	0.7552
Standard deviation:		15.4	0.0041	0.0897	0.0445	0.0721	0.3761	0.1173
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
4501/F	4/1	202.7	0.0313	0.9038	0.4300	0.9963	3.7238	0.8044
4502/F	4/1	215.6	0.0333	0.8819	0.4030	0.9846	3.6901	0.7725
4503/F	4/1	195.0	0.0376	0.9708	0.4048	0.9048	3.8057	0.8635

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Animal No/sex	Group/ Subgroup	Terminal Body wt. (g)	Adrenal Glands	Brain	Heart	Kidneys	Liver	Lungs
4504/F	4/1	221.6	0.0375	0.8369	0.4380	0.8869	3.6555	0.9107
4505/F	4/1	204.4	0.0356	0.9171	0.4124	0.9545	4.1501	0.9344
4506/F	4/1	216.7	0.0381	0.8489	0.4462	0.9409	4.0688	0.9868
4507/F	4/1	194.9	0.0349	0.9216	0.4390	1.0151	3.9629	0.8926
4508/F	4/1	193.8	0.0422	0.9275	0.4379	0.9715	4.3849	0.7866
4509/F	4/1	217.5	0.0339	0.8028	0.4352	0.7941	3.2601	0.8083
4510/F	4/1	210.2	0.0322	0.8929	0.3625	0.9475	3.6361	0.7681
M e a n:		207.2	0.0357	0.8904	0.4209	0.9396	3.8338	0.8528
Standard deviation:		10.5	0.0033	0.0495	0.0256	0.0645	0.3178	0.0760
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)

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Animal No/sex	Group/ Subgroup	Terminal Body wt. (g)	Pituitary gland Ovaries	Thymus	Spleen	Uterus
				Female Animals		
1501/F	1/1	216.4	0.0669	0.0056	0.2675	0.3050	0.3606
1502/F	1/1	192.8	0.0419	0.0034	0.2612	0.3019	0.2244
1503/F	1/1	199.5	0.0441	0.0056	0.2552	0.2571	0.2981
1504/F	1/1	211.8	0.0479	0.0061	0.2875	0.1998	0.1952
1505/F	1/1	207.0	0.0407	0.0069	0.2270	0.2638	0.2795
1506/F	1/1	201.6	0.0391	0.0054	0.2408	0.3096	0.2505
1507/F	1/1	213.0	0.0455	0.0072	0.2578	0.2946	0.3713
1508/F	1/1	215.5	0.0432	0.0069	0.2233	0.2187	0.2132
1509/F	1/1	212.7	0.0445	0.0061	0.2567	0.3340	0.4028
1510/F	1/1	220.8	0.0412	0.0035	0.1987	0.1894	0.2653
Mean:		209.1	0.0455	0.0057	0.2476	0.2674	0.2861
Standard deviation:		8.7	0.0079	0.0013	0.0255	0.0502	0.0713
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)
2501/F	2/1	208.7	0.0448	0.0070	0.2131	0.2876	0.2292
2502/F	2/1	202.0	0.0393	0.0066	0.2325	0.2686	0.3113
2503/F	2/1	191.6	0.0442	0.0073	0.3031	0.2227	0.2400
2504/F	2/1	216.6	0.0378	0.0067	0.2379	0.1961	0.2428
2505/F	2/1	191.7	0.0446	0.0074	0.2070	0.2832	0.3899
2506/F	2/1	216.1	0.0423	0.0061	0.2242	0.2168	0.2059
2507/F	2/1	201.3	0.0479	0.0068	0.1992	0.2728	0.2400
2508/F	2/1	202.0	0.0360	0.0075	0.2836	0.2618	0.5370
2509/F	2/1	223.8	0.0412	0.0062	0.2538	0.2942	0.2904
2510/F	2/1	198.5	0.0524	0.0070	0.2273	0.2250	0.2752
Mean:		205.2	0.0430	0.0068	0.2382	0.2529	0.2962
Standard deviation:		10.8	0.0049	0.0005	0.0333	0.0346	0.0996
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)
3501/F	3/1	216.2	0.0388	0.0072	0.2636	0.2460	0.3890
3502/F	3/1	183.3	0.0348	0.0088	0.2062	0.2402	0.2753
3503/F	3/1	196.1	0.0403	0.0075	0.2262	0.2665	0.3664
3504/F	3/1	211.3	0.0439	0.0067	0.2616	0.2488	0.2266
3505/F	3/1	182.0	0.0439	0.0063	0.2256	0.1932	0.2776
3506/F	3/1	190.2	0.0381	0.0053	0.2675	0.3131	0.2884
3507/F	3/1	197.9	0.0445	0.0059	0.2458	0.2690	0.1950
3508/F	3/1	222.0	0.0284	0.0056	0.2601	0.3170	0.2282
3509/F	3/1	215.7	0.0387	0.0061	0.1972	0.2085	0.2769
3510/F	3/1	220.6	0.0425	0.0064	0.2487	0.2168	0.3746
Mean:		203.5	0.0394	0.0066	0.2403	0.2519	0.2898
Standard deviation:		15.4	0.0050	0.0010	0.0251	0.0411	0.0668
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)
4501/F	4/1	202.7	0.0463	0.0078	0.2040	0.2289	0.3879
4502/F	4/1	215.6	0.0508	0.0052	0.2104	0.2273	0.2026
4503/F	4/1	195.0	0.0464	0.0073	0.2533	0.2972	0.3777

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Animal No/sex	Group/ Subgroup	Terminal Body wt. (g)	Ovaries	Pituitary gland	Spleen	Thymus	Uterus
4504/F	4/1	221.6	0.0506	0.0067	0.3142	0.2084	0.3050
4505/F	4/1	204.4	0.0523	0.0060	0.2512	0.3140	0.3021
4506/F	4/1	216.7	0.0321	0.0066	0.3240	0.2714	0.2267
4507/F	4/1	194.9	0.0504	0.0050	0.2426	0.2609	0.2827
4508/F	4/1	193.8	0.0459	0.0062	0.2335	0.1448	0.2368
4509/F	4/1	217.5	0.0423	0.0050	0.2267	0.2096	0.4532
4510/F	4/1	210.2	0.0497	0.0000	0.2651	0.2289	0.4960
M e a n:		207.2	0.0467	0.0056	0.2525	0.2392	0.3271
Standard deviation:		10.5	0.0060	0.0022	0.0399	0.0489	0.0986
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)

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Animal No/sex	Group/ Subgroup	Terminal Body wt. (g)	Adrenal Glands	Brain	Epididymides	Heart	Kidneys	Liver
				Male Animals				
1001/M	1/1	319.9	2.4515	100.0000	39.6660	69.4244	139.2143	581.9918
1002/M	1/1	289.7	2.4892	100.0000	40.3254	59.9723	144.5340	511.9380
1003/M	1/1	284.7	3.0272	100.0000	43.8406	62.7516	139.3075	503.7034
1004/M	1/1	292.5	3.4141	100.0000	46.5697	56.1605	148.1476	613.4734
1005/M	1/1	270.6	3.1397	100.0000	46.4219	55.3041	146.9315	520.0549
1006/M	1/1	269.7	2.9224	100.0000	42.2027	58.7281	133.4980	508.7151
1007/M	1/1	317.2	3.1997	100.0000	48.5384	59.8015	144.8154	619.4056
1008/M	1/1	297.4	2.8997	100.0000	38.9223	59.0916	155.9405	488.5707
1009/M	1/1	274.0	3.1953	100.0000	41.8470	63.3292	148.5724	563.9932
1010/M	1/1	275.5	3.4007	100.0000	45.9121	61.9101	137.6251	610.1719
Mean:		289.1	3.0140	100.0000	43.4246	60.6473	143.8586	552.2018
Standard deviation:		18.2	0.3344	0.0000	3.3229	4.0306	6.5480	51.2122
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
2001/M	2/1	307.7	3.0050	100.0000	43.4050	69.8117	152.5689	519.5352
2002/M	2/1	296.5	3.0214	100.0000	39.9812	69.2989	158.1927	561.0703
2003/M	2/1	304.1	3.1884	100.0000	51.5242	58.5707	151.2044	610.5948
2004/M	2/1	266.1	3.5594	100.0000	39.2519	63.7384	131.1191	611.0508
2005/M	2/1	305.0	2.6310	100.0000	35.4667	60.7594	124.2758	467.8780
2006/M	2/1	277.3	3.5332	100.0000	44.8976	49.7651	139.2504	589.8002
2007/M	2/1	282.1	2.5384	100.0000	37.1465	60.5394	145.3362	534.7120
2008/M	2/1	283.0	2.7997	100.0000	40.4719	60.8040	142.2489	586.8166
2009/M	2/1	257.5	2.5592	100.0000	38.8849	55.2148	125.9013	464.1262
2010/M	2/1	321.9	2.4296	100.0000	37.7578	68.2319	161.7711	586.1117
Mean:		290.1	2.9265	100.0000	40.8788	61.6734	143.1869	553.1696
Standard deviation:		20.3	0.4067	0.0000	4.6716	6.3917	13.1060	54.7162
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
3001/M	3/1	288.5	3.1477	100.0000	40.9147	66.9495	135.6406	546.9091
3002/M	3/1	298.2	2.9347	100.0000	34.9860	57.9027	151.3672	568.9855
3003/M	3/1	320.1	3.2061	100.0000	47.3110	71.4552	156.9397	619.0093
3004/M	3/1	269.7	2.9631	100.0000	39.6673	63.7797	147.6921	513.4998
3005/M	3/1	286.5	3.8484	100.0000	44.4949	61.4507	161.7480	551.3108
3006/M	3/1	267.1	2.7660	100.0000	42.3855	57.4343	110.1261	464.3440
3007/M	3/1	294.1	3.3049	100.0000	41.0854	56.0412	141.9332	516.9662
3008/M	3/1	299.1	3.3697	100.0000	39.8778	58.5952	136.5547	486.1277
3009/M	3/1	310.4	2.8426	100.0000	41.9993	66.4635	157.6011	673.5076
3010/M	3/1	290.7	3.0659	100.0000	37.8637	57.6207	144.8869	576.3494
Mean:		292.4	3.1449	100.0000	41.0586	61.7693	144.4490	551.7009
Standard deviation:		16.3	0.3151	0.0000	3.3991	5.1712	14.9485	62.2661
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
4001/M	4/1	295.6	2.3985	100.0000	50.3041	60.7685	141.4866	512.5266
4002/M	4/1	285.5	2.4491	100.0000	36.1823	57.0250	151.1021	528.5950
4003/M	4/1	277.8	2.8500	100.0000	35.5392	59.5326	147.9219	580.5949

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Animal No/sex	Group/ Subgroup	Terminal Body wt. (g)	Adrenal Glands	Brain	Epididymides	Heart	Kidneys	Liver
4004/M	4/1	324.5	3.0116	100.0000	45.3536	63.7024	151.2031	585.4105
4005/M	4/1	280.8	3.4120	100.0000	39.9047	62.6625	156.2608	547.0105
4006/M	4/1	282.4	2.3050	100.0000	43.3694	64.4727	147.0061	484.7668
4007/M	4/1	292.0	3.3242	100.0000	39.0249	69.0512	154.2339	489.7954
4008/M	4/1	296.9	3.2680	100.0000	34.9239	59.2895	147.2940	551.1929
4009/M	4/1	293.9	2.9199	100.0000	32.7817	72.3293	166.7780	509.9186
4010/M	4/1	270.1	3.2064	100.0000	44.7414	58.5625	125.1847	562.8976
Mean:		290.0	2.9145	100.0000	40.2125	62.7396	148.8471	535.2709
Standard deviation:		14.9	0.4074	0.0000	5.5929	4.8524	10.7335	35.8176
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)

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Animal No/sex	Group/ Subgroup	Terminal Body wt. (g)	Pituitary gland Lungs	Semis w/prostate		Spleen	Testes	Thymus
				M a l e	A n i m a l s			
1001/M	1/1	319.9	86.3618	0.2335	89.2042	29.8041	147.3201	24.5914
1002/M	1/1	289.7	80.1427	0.2720	83.0117	30.2145	147.1105	35.6703
1003/M	1/1	284.7	97.7616	0.4917	101.1320	32.9048	175.7568	28.5817
1004/M	1/1	292.5	87.5283	0.2531	84.9865	28.7668	150.6301	23.9365
1005/M	1/1	270.6	81.6712	0.5260	108.6904	27.4082	172.7014	26.0603
1006/M	1/1	269.7	76.0543	0.4524	72.3311	30.3624	158.0365	23.0929
1007/M	1/1	317.2	98.4051	0.4790	99.4914	38.3419	167.3069	25.7654
1008/M	1/1	297.4	103.1204	0.3746	108.5245	37.8650	153.0100	32.9074
1009/M	1/1	274.0	82.3609	0.5020	83.8668	31.1599	165.0510	28.7149
1010/M	1/1	275.5	85.9020	0.4952	79.6766	29.1764	154.1385	26.0283
M e a n:		289.1	87.9308	0.4080	91.0915	31.6004	159.1062	27.5349
Standard deviation:		18.2	8.9177	0.1147	12.5856	3.7230	10.4473	4.0340
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
2001/M	2/1	307.7	102.1434	0.5850	104.5527	32.3370	157.8662	24.9122
2002/M	2/1	296.5	120.1207	0.5589	113.1537	37.7124	180.4272	23.2527
2003/M	2/1	304.1	106.3818	0.4598	98.1809	29.2004	174.0280	30.6097
2004/M	2/1	266.1	91.9085	0.4604	76.3982	27.2958	172.2697	21.2944
2005/M	2/1	305.0	90.1759	0.3965	72.4029	31.9121	144.6984	43.9474
2006/M	2/1	277.3	86.2669	0.5597	82.0040	29.0755	144.3079	26.1269
2007/M	2/1	282.1	107.8122	0.5635	102.2211	34.3290	175.8193	30.5159
2008/M	2/1	283.0	87.7177	0.3949	73.3394	30.6298	155.0881	23.8001
2009/M	2/1	257.5	84.3658	0.5230	92.2718	30.3189	160.0234	20.1686
2010/M	2/1	321.9	96.5093	0.5107	101.9734	36.5381	162.3513	21.1027
M e a n:		290.1	97.3402	0.5012	91.6498	31.9349	162.6879	26.5731
Standard deviation:		20.3	11.5398	0.0698	14.6122	3.3657	12.7244	7.1039
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
3001/M	3/1	288.5	111.3326	0.4884	83.0233	31.1560	172.0065	29.3206
3002/M	3/1	298.2	86.6136	0.5008	103.7110	34.5803	117.2076	29.1867
3003/M	3/1	320.1	98.2470	0.5326	96.2664	38.7579	167.0390	26.9004
3004/M	3/1	269.7	85.6793	0.6089	104.8932	30.7835	170.4072	26.1295
3005/M	3/1	286.5	86.1035	0.5351	104.1619	27.3931	144.2517	23.3663
3006/M	3/1	267.1	92.2796	0.3762	103.2270	36.5992	169.2614	19.4203
3007/M	3/1	294.1	91.9586	0.5229	78.3582	29.9472	171.7586	21.3575
3008/M	3/1	299.1	115.2700	0.4917	106.5687	32.4706	157.4098	39.4534
3009/M	3/1	310.4	98.3414	0.5345	96.7578	31.7480	141.7395	29.8796
3010/M	3/1	290.7	113.9289	0.5191	78.6120	28.7002	144.7791	25.0612
M e a n:		292.4	97.9754	0.5110	95.5580	32.2136	155.5860	27.0076
Standard deviation:		16.3	11.6529	0.0583	11.3027	3.5249	18.2033	5.5834
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
4001/M	4/1	295.6	102.2106	0.4846	103.5359	29.7809	177.0882	23.1987
4002/M	4/1	285.5	95.5066	0.5498	69.0458	30.1245	156.2353	27.0105
4003/M	4/1	277.8	96.0218	0.5398	84.0926	28.4357	144.7048	20.6359

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Animal No/sex	Group/ Subgroup	Terminal Body wt. (g)	Lungs	Pituitary gland	Semis w/prostate	Spleen	Testes	Thymus
4004/M	4/1	324.5	107.5502	0.5634	81.5669	37.1189	160.9856	24.4827
4005/M	4/1	280.8	104.5331	0.4116	90.3975	28.2550	151.8414	27.3884
4006/M	4/1	282.4	93.3463	0.5020	84.2545	31.3476	165.5330	21.0265
4007/M	4/1	292.0	109.8181	0.5463	86.1929	30.9746	161.1864	25.1817
4008/M	4/1	296.9	93.7960	0.4743	100.5787	30.4274	160.8405	17.6113
4009/M	4/1	293.9	109.2759	0.6174	76.6004	36.8858	131.1068	34.3606
4010/M	4/1	270.1	103.6938	0.5489	84.1217	29.0786	153.7451	24.2099
	M e a n:	290.0	101.5752	0.5238	86.0387	31.2429	156.3267	24.5106
Standard deviation:		14.9	6.4333	0.0572	10.2473	3.1972	12.3801	4.5774
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)

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Animal No/sex	Group/ Subgroup	Terminal Body wt. (g)	Adrenal Glands	Brain	Heart	Kidneys	Liver	Lungs
				Female Animals				
1501/F	1/1	216.4	3.8066	100.0000	41.9713	106.8135	465.5277	80.4632
1502/F	1/1	192.8	3.6927	100.0000	41.8329	93.0674	345.4771	79.6388
1503/F	1/1	199.5	2.8312	100.0000	43.6848	90.7356	397.2841	84.1451
1504/F	1/1	211.8	4.0504	100.0000	48.9175	118.7723	457.3637	94.8972
1505/F	1/1	207.0	4.2280	100.0000	48.7549	101.2776	438.8643	78.8220
1506/F	1/1	201.6	3.1444	100.0000	42.9265	91.3156	349.6025	95.8075
1507/F	1/1	213.0	3.1579	100.0000	50.1084	109.9974	459.0797	74.1603
1508/F	1/1	215.5	3.7996	100.0000	50.0857	97.1451	379.5692	79.0605
1509/F	1/1	212.7	4.1144	100.0000	46.0675	101.4810	439.1984	88.9305
1510/F	1/1	220.8	3.9576	100.0000	53.3345	111.7211	444.7794	76.0694
Mean:		209.1	3.6783	100.0000	46.7684	102.2327	417.6746	83.1995
Standard deviation:		8.7	0.4730	0.0000	4.0273	9.4727	45.8749	7.5905
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
2501/F	2/1	208.7	3.9357	100.0000	48.8516	103.8225	481.7932	64.7671
2502/F	2/1	202.0	3.0978	100.0000	48.1869	92.7580	359.8736	92.2607
2503/F	2/1	191.6	3.3170	100.0000	42.0531	102.0119	421.9964	111.9938
2504/F	2/1	216.6	3.7914	100.0000	49.9552	104.5699	433.5182	75.8905
2505/F	2/1	191.7	4.3207	100.0000	41.8530	91.7846	435.2351	78.4979
2506/F	2/1	216.1	3.6882	100.0000	50.7123	96.2497	407.2002	66.8324
2507/F	2/1	201.3	5.0473	100.0000	42.0816	109.1831	460.8409	79.4178
2508/F	2/1	202.0	3.4165	100.0000	44.4727	98.8453	433.4764	60.9831
2509/F	2/1	223.8	3.9168	100.0000	46.2302	119.7154	502.0740	76.5358
2510/F	2/1	198.5	4.2229	100.0000	46.3440	102.1168	451.2331	79.3585
Mean:		205.2	3.8754	100.0000	46.0741	102.1057	438.7241	78.6538
Standard deviation:		10.8	0.5644	0.0000	3.3556	8.2196	39.5412	14.7376
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
3501/F	3/1	216.2	4.9510	100.0000	47.7706	109.4490	423.9609	77.2308
3502/F	3/1	183.3	3.0115	100.0000	40.8373	88.1644	395.3212	79.8020
3503/F	3/1	196.1	4.2571	100.0000	45.5005	96.2750	388.1296	84.2677
3504/F	3/1	211.3	4.0190	100.0000	54.1781	120.2190	419.1078	85.2295
3505/F	3/1	182.0	3.8518	100.0000	41.3702	81.6407	337.7710	77.7047
3506/F	3/1	190.2	3.1099	100.0000	45.2890	94.6882	377.6002	58.6582
3507/F	3/1	197.9	3.7149	100.0000	46.0074	91.0444	430.3769	63.3634
3508/F	3/1	222.0	4.8794	100.0000	66.3761	127.2161	426.8708	95.7659
3509/F	3/1	215.7	4.5815	100.0000	42.0440	94.6513	502.3284	100.4936
3510/F	3/1	220.6	3.7792	100.0000	46.8880	104.9051	512.3541	103.3048
Mean:		203.5	4.0155	100.0000	47.6261	100.8253	421.3821	82.5821
Standard deviation:		15.4	0.6668	0.0000	7.6307	14.4688	53.3788	14.6658
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)
4501/F	4/1	202.7	3.4660	100.0000	47.5738	110.2287	411.9972	88.9962
4502/F	4/1	215.6	3.7816	100.0000	45.6951	111.6499	418.4453	87.5980
4503/F	4/1	195.0	3.8772	100.0000	41.6988	93.1964	392.0131	88.9441

Huntingdon Life Sciences
Princeton Research Center
East Millstone, New Jersey
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Summary Statistics for % Organ to Brain Weight
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Animal No/sex	Group/ Subgroup	Terminal Body wt. (g)	Adrenal Glands	Brain	Heart	Kidneys	Liver	Lungs
4504/F	4/1	221.6	4.4756	100.0000	52.3376	105.9800	436.8024	108.8218
4505/F	4/1	204.4	3.8784	100.0000	44.9667	104.0811	452.5367	101.8885
4506/F	4/1	216.7	4.4901	100.0000	52.5658	110.8339	479.2944	116.2427
4507/F	4/1	194.9	3.7858	100.0000	47.6395	110.1436	430.0023	96.8545
4508/F	4/1	193.8	4.5452	100.0000	47.2156	104.7399	472.7678	84.8122
4509/F	4/1	217.5	4.2266	100.0000	54.2122	98.9119	406.0879	100.6873
4510/F	4/1	210.2	3.6017	100.0000	40.5935	106.1112	407.2194	86.0248
M e a n:		207.2	4.0128	100.0000	47.4499	105.5877	430.7166	96.0870
Standard deviation:		10.5	0.3917	0.0000	4.5366	5.8509	29.4381	10.6748
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)	(10)

Huntingdon Life Sciences
Princeton Research Center
East Millstone, New Jersey

Summary Statistics for % Organ to Brain Weight
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Terminal Sacrifice

Animal No/sex	Group/ Subgroup	Terminal Body wt. (g)	Pituitary gland Ovaries	Thymus	Spleen		Uterus
				Female Animals			
1501/F	1/1	216.4	7.5145	0.6336	30.0634	34.2802	40.5224
1502/F	1/1	192.8	4.3504	0.3504	27.1429	31.3747	23.3261
1503/F	1/1	199.5	4.6086	0.5820	26.6922	26.8914	31.1854
1504/F	1/1	211.8	5.5632	0.7070	33.3735	23.1954	22.6583
1505/F	1/1	207.0	4.5637	0.7741	25.4331	29.5583	31.3177
1506/F	1/1	201.6	4.0686	0.5576	25.0671	32.2233	26.0791
1507/F	1/1	213.0	5.1309	0.8146	29.0452	33.1870	41.8302
1508/F	1/1	215.5	4.8326	0.7734	24.9779	24.4692	23.8515
1509/F	1/1	212.7	4.7816	0.6520	27.5930	35.9078	43.3077
1510/F	1/1	220.8	5.1027	0.4379	24.6267	23.4815	32.8843
Mean:		209.1	5.0517	0.6283	27.4015	29.4569	31.6963
Standard deviation:		8.7	0.9632	0.1507	2.7680	4.6726	7.9027
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)
2501/F	2/1	208.7	5.0356	0.7871	23.9756	32.3593	25.7871
2502/F	2/1	202.0	4.1080	0.6942	24.3317	28.1030	32.5787
2503/F	2/1	191.6	4.3642	0.7170	29.9562	22.0119	23.7245
2504/F	2/1	216.6	4.5867	0.8121	28.8587	23.7847	29.4523
2505/F	2/1	191.7	4.3359	0.7201	20.1227	27.5268	37.9076
2506/F	2/1	216.1	4.7345	0.6786	25.0971	24.2683	23.0510
2507/F	2/1	201.3	5.4973	0.7748	22.8438	31.2863	27.5265
2508/F	2/1	202.0	3.8561	0.7998	30.3406	28.0153	57.4607
2509/F	2/1	223.8	4.8409	0.7298	29.8173	34.5689	34.1279
2510/F	2/1	198.5	5.5875	0.7468	24.2358	23.9940	29.3451
Mean:		205.2	4.6947	0.7460	25.9579	27.5918	32.0962
Standard deviation:		10.8	0.5654	0.0457	3.5360	4.1516	10.0479
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)
3501/F	3/1	216.2	4.6881	0.8727	31.8825	29.7511	47.0490
3502/F	3/1	183.3	3.2680	0.8260	19.3926	22.5888	25.8875
3503/F	3/1	196.1	4.1675	0.7745	23.3720	27.5343	37.8556
3504/F	3/1	211.3	5.0062	0.7606	29.8160	28.3649	25.8348
3505/F	3/1	182.0	4.2044	0.5999	21.6060	18.5066	26.5891
3506/F	3/1	190.2	3.9417	0.5491	27.6573	32.3764	29.8266
3507/F	3/1	197.9	4.7447	0.6308	26.2307	28.7001	20.8066
3508/F	3/1	222.0	3.5718	0.7019	32.6899	39.8392	28.6709
3509/F	3/1	215.7	4.4796	0.7028	22.8165	24.1255	32.0386
3510/F	3/1	220.6	4.8843	0.7350	28.6020	24.9270	43.0776
Mean:		203.5	4.2956	0.7153	26.4065	27.6714	31.7636
Standard deviation:		15.4	0.5745	0.1008	4.4950	5.8310	8.3577
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)
4501/F	4/1	202.7	5.1198	0.8679	22.5752	25.3261	42.9180
4502/F	4/1	215.6	5.7645	0.5891	23.8626	25.7718	22.9790
4503/F	4/1	195.0	4.7805	0.7501	26.0948	30.6165	38.9044

Huntingdon Life Sciences
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Terminal Sacrifice

Summary Statistics for % Organ to Brain Weight
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Animal No/sex	Group/ Subgroup	Terminal Body wt. (g)	Ovaries	Pituitary gland	Spleen	Thymus	Uterus
4504/F	4/1	221.6	6.0501	0.7981	37.5411	24.9070	36.4465
4505/F	4/1	204.4	5.7029	0.6508	27.3886	34.2438	32.9421
4506/F	4/1	216.7	3.7834	0.7828	38.1713	31.9743	26.7069
4507/F	4/1	194.9	5.4727	0.5400	26.3222	28.3042	30.6703
4508/F	4/1	193.8	4.9458	0.6732	25.1794	15.6161	25.5299
4509/F	4/1	217.5	5.2632	0.6242	28.2344	26.1039	56.4515
4510/F	4/1	210.2	5.5624	0.0053	29.6926	25.6380	55.5491
M e a n:		207.2	5.2445	0.6281	28.5062	26.8502	36.9098
Standard deviation:		10.5	0.6444	0.2415	5.3351	5.0850	11.7942
Number of observ. :		(10)	(10)	(10)	(10)	(10)	(10)

	Individual Animal Gross and Microscopic Observations Preface	Appendix H

Key to Abbreviation

LN = Lymph Node

Corresponding exposure levels for each group were as follows:

Group 1 - 0 mg/m^3
Group 2 - 25 mg/m^3
Group 3 - 75 mg/m^3
Group 4 - 200 mg/m^3

Notes: Unless otherwise specified in a histopathology note, the organ/tissue examined was the required (routine) section.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 1001
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 1

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	No gross observations on tissue.	ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Minimal. - SIX SECTIONS OF LUNG LOBE PRESENT ON MICROSLIDE.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
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Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 1002
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 1

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	No gross observations on tissue.	ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Minimal. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 1003
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 1

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	No gross observations on tissue.	ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Minimal. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
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Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 1004
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 1

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	No gross observations on tissue.	ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Minimal. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
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Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 1005
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 1

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	No gross observations on tissue.	ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Minimal. - SIX SECTIONS OF LUNG LOBE PRESENT ON MICROSLIDE.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 1006
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 1

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	No gross observations on tissue.	ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Minimal. - SIX SECTIONS OF LUNG LOBE PRESENT ON MICROSLIDE.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 1007
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 1

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	No gross observations on tissue.	ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Minimal. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 1008
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 1

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	No gross observations on tissue.	ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Minimal. - SIX SECTIONS OF LUNG LOBE PRESENT ON MICROSLIDE.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 1009
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 1

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	No gross observations on tissue.	ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Minimal. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 1010
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 1

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	No gross observations on tissue.	ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Minimal. - SIX SECTIONS OF LUNG LOBE PRESENT ON MICROSLIDE.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 2001
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 2

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Enlarged, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Focal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 2002
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 2

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs		
	Discolored, All lobes, Pale, Severe	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Slight.
	Discolored, All lobes, Black, Areas, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight. - SIX SECTIONS OF LUNG LOBE PRESENT ON MICROSLIDE. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 2003
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 2

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	Discolored, All lobes, Black, Slight	Examined; 1 correlation found: BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 2004
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 2

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Enlarged, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 2005
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 2

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Enlarged, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 2006
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 2

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	Discolored, All lobes, Black, Slight	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 2007
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 2

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Minimal. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 2008
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 2

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs		
	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 2009
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 2

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Enlarged, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 2010
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 2

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs		
	Discolored, All lobes, Brown, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 3001
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 3

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Enlarged, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice | SEX: Male | ANIMAL: 3002
PHASE DAY OF DEATH: 14 | PHASE: Dosing phase | GROUP: 3

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Epididymides	Small, Left, Severe	No micropathology observations on tissue.
Mediastinal LN	Enlarged, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Minimal. - SIX SECTIONS OF LUNG LOBE PRESENT ON MICROSLIDE. FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.
Prostate	Small, Ventral, Left, Slight	No micropathology observations on tissue.
Testes	Small, Left, Severe Enlarged, Right, Moderate	No micropathology observations on tissue.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
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Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 3002
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 3

Tissue	Gross Observations/Comments	Microscopic Observations/Comments

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 3003
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 3

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Minimal. - SIX SECTIONS OF LUNG LOBE PRESENT ON MICROSLIDE. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice
PHASE DAY OF DEATH: 14

SEX: Male
PHASE: Dosing phase

ANIMAL: 3004
GROUP: 3

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. BRONCHIOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Slight. - SIX SECTIONS OF LUNG LOBE PRESENT ON MICROSLIDE. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 3005
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 3

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs		
	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Minimal. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 3006
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 3

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Black, Slight Enlarged, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. BRONCHIOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Focal, Slight. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 3006
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 3

Tissue	Gross Observations/Comments	Microscopic Observations/Comments

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice | SEX: Male | ANIMAL: 3007
PHASE DAY OF DEATH: 14 | PHASE: Dosing phase | GROUP: 3

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Black, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Focal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice | SEX: Male | ANIMAL: 3008
PHASE DAY OF DEATH: 14 | PHASE: Dosing phase | GROUP: 3

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Black, Moderate Enlarged, Severe	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Severe	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. - SIX SECTIONS OF LUNG LOBE PRESENT ON MICROSLIDE. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 3009
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 3

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Enlarged, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Focal, Slight. OSSEOUS METAPLASIA, Focal, Slight. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
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Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice | SEX: Male | ANIMAL: 3010
PHASE DAY OF DEATH: 14 | PHASE: Dosing phase | GROUP: 3

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	Discolored, All lobes, Black, Severe	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Focal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. - SIX SECTIONS OF LUNG LOBE PRESENT ON MICROSLIDE. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
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Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice | SEX: Male | ANIMAL: 4001
PHASE DAY OF DEATH: 14 | PHASE: Dosing phase | GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Enlarged, Slight Discolored, Black, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Severe	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Moderate. BRONCHIOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
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Petroleum Coke
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Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 4002
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Black, Severe Enlarged, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Severe	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Focal, Slight. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

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Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 4002
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice | SEX: Male | ANIMAL: 4003
PHASE DAY OF DEATH: 14 | PHASE: Dosing phase | GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Black, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Severe	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Moderate. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Focal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 14		SEX: Male PHASE: Dosing phase	ANIMAL: 4004 GROUP: 4
Tissue	Gross Observations/Comments	Microscopic Observations/Comments	
Mediastinal LN	Discolored, Black, Moderate Enlarged, Slight	No micropathology observations on tissue.	
Lungs	Discolored, All lobes, Black, Severe	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. BRONCHIOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES. PIGMENT PROMINENT IN 1-2 LUNG LOBES.	

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 4004
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 4005
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Black, Severe Enlarged, Moderate	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Severe	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Moderate. BRONCHIOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. - SIX SECTIONS OF LUNG LOBE PRESENT ON MICROSLIDE. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice | SEX: Male | ANIMAL: 4006
PHASE DAY OF DEATH: 14 | *PHASE:* Dosing phase | GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Slight Enlarged, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. BRONCHIOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 4006
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 4007
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Black, Moderate	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Severe	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. BRONCHIOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 4008
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Black, Severe Enlarged, Moderate	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Severe	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. BRONCHIOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 4008
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 4009
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN		No micropathology observations on tissue.
	Discolored, Black, Slight	
	Enlarged, Slight	
Lungs		
	Discolored, All lobes, Black, Severe	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. BRONCHIOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 4009
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 4010
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Red, Moderate	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Red, Severe	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. BRONCHIOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Male	ANIMAL: 4010
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 1501
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 1

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	No gross observations on tissue.	ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Minimal. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
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STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 1502
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 1

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	No gross observations on tissue.	ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Minimal. - SIX SECTIONS OF LUNG LOBE PRESENT ON MICROSLIDE.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
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Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 1503
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 1

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	No gross observations on tissue.	ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Minimal. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 1504
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 1

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	No gross observations on tissue.	ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Minimal. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 1505
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 1

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	No gross observations on tissue.	ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Minimal. - SIX SECTIONS OF LUNG LOBE PRESENT ON MICROSLIDE.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 1506
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 1

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	No gross observations on tissue.	ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight. - SIX SECTIONS OF LUNG LOBE PRESENT ON MICROSLIDE.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
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Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 1507
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 1

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	No gross observations on tissue.	ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 1508
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 1

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	No gross observations on tissue.	ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
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Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 1509
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 1

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	No gross observations on tissue.	ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Minimal.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
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Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 1510
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 1

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	No gross observations on tissue.	ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Minimal.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
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in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 14	SEX: Female PHASE: Dosing phase	ANIMAL: 2501 GROUP: 2

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs		
	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight. - SIX SECTIONS OF LUNG LOBE PRESENT ON MICROSLIDE. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 14	SEX: Female PHASE: Dosing phase	ANIMAL: 2502 GROUP: 2

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Enlarged, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
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Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 2503
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 2

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 2504
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 2

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	Discolored, All lobes, Brown, Severe	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 2505
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 2

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	Discolored, All lobes, Brown, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice | SEX: Female | ANIMAL: 2506
PHASE DAY OF DEATH: 14 | PHASE: Dosing phase | GROUP: 2

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Enlarged, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Focal, Minimal. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice | SEX: Female | ANIMAL: 2507
PHASE DAY OF DEATH: 14 | PHASE: Dosing phase | GROUP: 2

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Black, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Focal, Minimal. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 2508
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 2

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Focal, Minimal. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 2509
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 2

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs		
	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 2510
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 2

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Focal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 3501
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 3

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Black, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Severe	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice | SEX: Female | ANIMAL: 3502
PHASE DAY OF DEATH: 14 | PHASE: Dosing phase | GROUP: 3

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Enlarged, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice | SEX: Female | ANIMAL: 3503
PHASE DAY OF DEATH: 14 | PHASE: Dosing phase | GROUP: 3

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Black, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 3504
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 3

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Black, Slight Enlarged, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Moderate. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Focal, Minimal. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
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Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 3505
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 3

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Black, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Moderate. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Focal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 3506
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 3

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Black, Slight Enlarged, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Moderate. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 3507
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 3

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Slight. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Focal, Minimal. OSSEOUS METAPLASIA, Focal, Slight. - SIX SECTIONS OF LUNG LOBE PRESENT ON MICROSLIDE. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice | SEX: Female | ANIMAL: 3508
PHASE DAY OF DEATH: 14 | PHASE: Dosing phase | GROUP: 3

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Lungs	Discolored, All lobes, Black, Severe	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Moderate. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PROMINENT IN 1-2 LUNG LOBES. DUE TO ARTIFACTUAL CHANGES, TISSUE IS DIFFICULT TO EVALUATE.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 14	SEX: Female PHASE: Dosing phase	ANIMAL: 3509 GROUP: 3

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Black, Moderate	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. BRONCHIOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice | SEX: Female | ANIMAL: 3510
PHASE DAY OF DEATH: 14 | PHASE: Dosing phase | GROUP: 3

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Enlarged, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Focal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 4501
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN		No micropathology observations on tissue.
	Discolored, Black, Slight	
	Enlarged, Slight	
Lungs		
	Discolored, All lobes, Black, Moderate/ .	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. BRONCHIOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 4501
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice | SEX: Female | ANIMAL: 4502
PHASE DAY OF DEATH: 14 | PHASE: Dosing phase | GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Black, Moderate	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. BRONCHIOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 4502
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice | SEX: Female | ANIMAL: 4503
PHASE DAY OF DEATH: 14 | PHASE: Dosing phase | GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Black, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Severe	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

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Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
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Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 4504
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Black, Slight Enlarged, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Severe	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. BRONCHIOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES. PIGMENT PROMINENT IN 1-2 LUNG LOBES.

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice PHASE DAY OF DEATH: 14	SEX: Female PHASE: Dosing phase	ANIMAL: 4504 GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice | SEX: Female | ANIMAL: 4505
PHASE DAY OF DEATH: 14 | PHASE: Dosing phase | GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Black, Moderate Enlarged, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Severe	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. BRONCHIOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENTED ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES. IN GENERAL, SEVERITY OF CHANGES ARE IN 2 OF 5 LOBES.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 4505
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 4506
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN		No micropathology observations on tissue.
	Discolored, Black, Slight	
	Enlarged, Slight	
Lungs		
	Discolored, All lobes, Black, Moderate	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 4507
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Black, Moderate	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Severe	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 4508
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Black, Slight Enlarged, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Severe	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Moderate. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Minimal. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES. IN GENERAL, SEVERITY OF CHANGES ARE IN 2 OF 5 LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice | SEX: Female | ANIMAL: 4509
PHASE DAY OF DEATH: 14 | PHASE: Dosing phase | GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Black, Slight Enlarged, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Severe	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Slight. - SIX SECTIONS OF LUNG LOBE PRESENT ON MICROSLIDE. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES. IN GENERAL, SEVERITY OF CHANGES ARE IN 2 OF 5 LOBES.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 4509
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

08-Jun-04; 17:43
Huntingdon Life Sciences, Inc. 036147

Petroleum Coke
A 2-Week Range-Finding Inhalation Toxicity Study
in the Rat via Nose-Only Exposures
Individual Animal Gross and Microscopic Observations

STATUS: Final phase sacrifice	SEX: Female	ANIMAL: 4510
PHASE DAY OF DEATH: 14	PHASE: Dosing phase	GROUP: 4

Tissue	Gross Observations/Comments	Microscopic Observations/Comments
Mediastinal LN	Discolored, Black, Moderate Enlarged, Slight	No micropathology observations on tissue.
Lungs	Discolored, All lobes, Black, Severe	Examined; 1 correlation found: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Moderate. ALVEOLAR DUCT/ALVEOLAR EPITHELIAL HYPERPLASIA/HYPERTROPHY, Multifocal, Slight. ALVEOLAR/INTRAALVEOLAR MACROPHAGES, Multifocal, Moderate. BRONCHIOLAR ASSOCIATED LYMPHOID TISSUE: BROWN-BLACK PIGMENT DEPOSITS, Multifocal, Slight. - FIVE SECTIONS OF LUNG LOBES PRESENT ON MICROSLIDES. PIGMENT DEPOSITS ARE PRIMARILY AT BRONCHILOLAR-ALVEOLAR SITES (TERMINAL BRONCHIOLE/ALVEOLAR DUCT/CENTRAL ALVEOLI) AND TEND TO BE CENTRIFUGAL IN DISTRIBUTION. PIGMENT PRESENT IN ALL LUNG LOBES.

Tissues without comment under Gross Observations were within normal limits at necropsy.
The following tissues were unremarkable microscopically:
No tissues examined.

	Equipment List	Appendix I

Exposure Chambers
40 Liter cast aluminum and alloy chamber with Polycarbonate nose-only tubes (ADG Limited, Inc.).

Compound Generator
Wright Dust Feeder, Model Mark II/WDF-II (small diameter cups) with a Wright Dust Feeder Speed Selector, Model E-352-BM (BGI, Inc.).

Compound Preparation
Stainless Steel Sieve, #60 opening, Fisher Scientific Co.

Flowmeters
Flowmeter, size 0 – 10, 0 – 20, 0 – 30, 0 – 40 Lpm (Dwyer®), calibrated prestudy with a Top Trak™ Mass Flowmeter, Model 822-13-OV1 PV1-V1 (Sierra Instruments).

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

Pressure Gauges
USG backpressure gauge, PN 12672-1.
Norgreen backpressure gauge, PN 9892K23.
Ashcroft backpressure gauge, PN 733-47.
Marshall Town backpressure gauge.

Regulators
Union Carbide, P/N SG 3800 30.
Norgreen, PN 9892K23

Valves
Metering Valve, Model SS-4L Series (Nupro® Co.).

Tubing
Plastic, size ¼", ½", 1" (Norton, Baxter).
Teflon®, size ½".
Y-Tube, plastic.
Stainless Steel, size ½".

	Equipment List	Appendix I

Filter
Glass fiber filter paper, Type A/E, Size 3.7 cm, Lot No. 32928 and 13512 (Gelman Sciences Inc.).

Filter holder
Open-faced filter holder (Gelman Sciences Inc.).

Drying Unit
Drierite® Laboratory Gas Drying Unit (W. A. Hammond Drierite® Co.).

Particle Sizer/Analyzer
TSI Aerodynamic Particle Sizer, Model 331001 and a DELL computer, Model 486P/25, equipped with Epson Dot matrix printer, Model P630B.
Delron DCI-6 Cascade Impactor, Serial No. 695 with stainless steel slides, greased with lubricant (Dow-Corning) and a glass fiber filter paper, Type A/E, size 7.6 cm, Lot No. 00830 (Gelman Sciences, Inc.).

Vacuum Pump
Thomas Industries, Inc., Model 707CM50.

Timers
Gralab Universal Timer, Model 171.

Environmental Monitoring
Sunbeam and Springfield Temperature and Humidity Gauge, calibrated prestudy with Digital Hygrometer-Thermometer, ID No. LA (VWR).

Balances
Sartorius LC6200S (Sartorius Corporation).
AND ER-182A.

Miscellaneous
Brass Cyclones #1, #2 and #3 (Intox).
Carver Laboratory press model #C, serial # 32000-136.

	Chamber Distribution Records	Appendix J

Group (target)	Date	Port	Concentration (mg/m^3)	Ratio to H-1
2 (25 mg/m^3)	26-Feb-04	H-1	11	1.00
		H-2	9.4	0.85
	1-Mar-04	H-1	17	1.00
		H-2	19	1.12
3 (75 mg/m^3)	26-Feb-04	H-1	17	1.00
		H-2	18	1.06
	1-Mar-04	H-1	79	1.00
		H-2	70	0.89
4 (200 mg/m^3)	28-Feb-04	H-1	200	1.00
		H-2	230	1.15
	1-Mar-04	H-1	200	1.00
		H-2	170	0.85

Appendix K

PROTOCOL

PETROLEUM COKE

A 2-WEEK RANGE-FINDING INHALATION TOXICITY STUDY IN THE RAT VIA NOSE-ONLY EXPOSURES

CONFIDENTIAL

HLS Study No.:	**03-6147**
Protocol No.:	**Final**
Date:	**17 February 2004**

PROTOCOL SIGNATURES / PREFACE

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

Study Title: Petroleum Coke: A 2-Week Range-Finding Inhalation Toxicity Study in the Rat via Nose-Only Exposures

HLS Study No.: 03-6147

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

[redacted]

17 Feb 04
Date

Huntingdon Life Sciences (HLS)
Address: 100 Mettlers Road
East Millstone, NJ 08875-2360
Phone No.: 732-873-2550 x2920
Fax No.: 732-873-3992

[redacted]

17 February, 2004
Date

American Petroleum Institute (API)
Address: 1220 L Street, Northwest
Washington, D.C. 20005-4070
Phone No.: 202-682-8480
Fax No.: 202-682-8270

[redacted]

TABLE OF CONTENTS

1. INTRODUCTION

HLS Study No.	03-6147
Study Title	Petroleum Coke: A 2-Week Range-Finding Inhalation Toxicity Study in the Rat via Nose-Only Exposures
Testing Facility	Huntingdon Life Sciences 100 Mettlers Road East Millstone, NJ 08875-2360
Purpose	This study is designed to provide a preliminary assessment of the toxicity of the test substance when administered via nose-only inhalation to rats for 2 weeks in order to determine exposure levels for a subsequent OECD 421 inhalation study 03-4246.

2. STUDY PERSONNEL

Study Director	Gary M. Hoffman, B.A., DABT
Alternate Contact	Keith P. Hazelden, BSc, CBiol, MIBiol Director of Reproductive Toxicology Tel.: 732-873-2550 x2590

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

3. PROPOSED STUDY DATES

Study Initiation	Date Study Director signs protocol
Receipt of Test Animals	17 February 2004 (Experimental Start)*
First Day of Treatment	2 March 2004 (males) (Experimental Start)**; 3 March 2004 (females)
Last Day of Treatment	15 March 2004 (males); 16 March 2004 (females)
Necropsy - Termination	16 March 2004 (males); 17 March 2004 (females)
Submission of Audited Draft Report	17 June 2004
Experimental Termination	Date of last data collection
Study Completion	Date final report is signed by Study Director

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

4. EXPERIMENTAL DESIGN

4.1. STUDY SUMMARY

Group	Group Designation	Exposure Level[a]	Number of Animals			
			Initial		Necropsy[b]	
		mg/m^3	M	F	M	F
1	**Air Control**	0.0	10	10	10	10
2	**Low**	5.0	10	10	10	10
3	**Mid**	20	10	10	10	10
4	**High**	50	10	10	10	10

[a]Exposures will be 6 hours per day for 7 consecutive days per week for 2 weeks for a total of at least 14 exposures. Exposure levels are expressed as mg/m^3 of test substance. The exposures will be conducted via nose-only exposure because this regimen will minimize the dermal deposition, and possible oral absorption, of the test substance.

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

M = male; F = female.

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

4.2. JUSTIFICATION FOR ROUTE, DURATION AND FREQUENCY

The inhalation route is one of the potential routes of human exposure to this test substance. The duration of the study and frequency of exposures are considered to be the minimum necessary for determining exposure levels for a subsequent OECD 421 Study 03-4246.

4.3. JUSTIFICATION FOR TEST ANIMAL SELECTION

The rat is an animal model commonly utilized in toxicity studies as recommended in OECD and EPA guidelines. In addition, a historical data-base is available for comparative evaluation.

4.4. JUSTIFICATION FOR NUMBER OF ANIMALS

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

4.5. JUSTIFICATION FOR EXPOSURE LEVEL SELECTION

The exposure levels were selected, based on prior results (HLS study 97-6119) of pulmonary toxicity after 5 days of exposure at exposure levels greater than 50 mg/m^3, in order to determine exposure levels for a subsequent OECD 421 Study 03-4246.

5. TEST SUBSTANCE

5.1. TEST SUBSTANCE: PETROLEUM COKE

Test Substance Category: Residual product from petroleum refining

Description, lot number, storage, expiration date (if available) and handling procedures, as well as other pertinent information will be documented in the study data.

5.2. IDENTIFICATION OF TEST SUBSTANCE

Unless otherwise noted, the identity, strength, purity, composition, stability and method of synthesis, fabrication and/or derivation of each batch of the test substance will be documented by the Sponsor. This documentation will be maintained by the Sponsor. The test substance will be stored (ambient conditions) in the inhalation laboratory and handled routinely while wearing gloves, dust-mask and labcoat.

5.3. ARCHIVAL SAMPLES

An archival sample from each lot of test substance will be taken and shipped to the Archives of the Sponsor (EPL Archives, Inc., 45610 Terminal Drive, Sterling, VA, 703-435-8780 ext 201, attn: Sam Busey). If multiple studies are conducted with the same test substance, a common archival sample may be taken and appropriately labeled.

5.4. ADMINISTRATION OF TEST SUBSTANCE

The test substance will be administered by nose-only inhalation exposure. The test substance will be administered as a dust (depending on the physical properties of the test substance) in the breathing air of the animals. The test atmosphere will be generated by an appropriate procedure (Wright Dust Feeder) determined during pre-study trials. The trials will be performed (at least two 6-hour periods) to evaluate the optimal set of conditions and equipment to generate a stable and uniform atmosphere at the target exposure levels with a mass median aerodynamic diameter of 1.0 - 3.0 microns. The method will be described in the raw data of the study and in the report.

The nose-only exposure chambers will each have a volume of approximately 40 liters. Each chamber will be operated at a minimum flow rate of 8 liters per minute. The final airflow will be set to provide at least one air change in 5.0 minutes (12 air changes/hour) and a T_{99} equilibrium time of at most 23 minutes. This chamber size and air flow rate is considered adequate to maintain the oxygen level at least 19%. At the end of the exposure, all animals will remain in the chamber for a minimum of 30 minutes. During this time the chamber will be operated at approximately the same flow rate using clean air only.

5.5. EXPOSURE CONCENTRATION DETERMINATION

A nominal exposure concentration will be calculated daily. The flow of air through the chamber will be monitored using appropriate calibrated equipment. The test substance consumed during the exposure will be divided by the total volume of air passing through the chamber (volumetric flow rate times total exposure time) to give the nominal concentration.

During each exposure, measurements of airborne concentrations of test substance will be performed at least four times using a gravimetric sampling procedure. Also prior to initiation of animal exposures, additional samples will be taken to determine the distribution of the test substance in the exposure chamber.

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

5.6. PARTICLE SIZE DISTRIBUTION ANALYSIS:

During each exposure, particle size determinations will be performed using a cascade impactor or other appropriate device, to characterize the aerodynamic particle size distribution of any aerosol present.

5.7. CHAMBER ENVIRONMENT:

Temperature, humidity and airflow rate will be recorded every 30 minutes during exposure. Chamber temperature and relative humidity will be maintained, to the extent possible, between 20 to 24°C and 40 to 60%, respectively.

5.8. SUMMARY OF CHAMBER ACTIVITY:

The minimum frequency of chamber activity is summarized below.

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

5.9. FREQUENCY AND DURATION OF ADMINISTRATION

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

5.10. UNUSED TEST SUBSTANCE

The unused portion of the test substance as well as any empty test substance containers will be returned to the Archives of the Sponsor (see section 5.3) following completion of the in-life phase of the final study with this test substance. In the event the Sponsor wishes the Testing Facility to arrange for disposal, a cost for this service will be provided.

6. TEST ANIMALS

6.1. SPECIES

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

Female rats will be nulliparous and non-pregnant.

6.2. SUPPLIER

Charles River Laboratories
Kingston, New York

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

6.3. ANIMAL REQUIREMENTS/SPECIFICATIONS

6.3.1. NUMBER OF ANIMALS ON STUDY

Total	Males	Females
80	40	40

6.3.2. AGE

Young adult (approximately 6 weeks at receipt; approximately 8 weeks (and no more than 9 weeks) at initiation of exposures.

6.3.3. WEIGHT

Approximately 200 to 300 grams (males) and 150 to 250 grams (females) at first exposure. Animals outside of this range may be used at the discretion of the Study Director.

6.4. ACCLIMATION PERIOD

Approximately 2 weeks; all animals will be checked for viability twice daily. Prior to assignment to study, all animals will be examined to ascertain suitability for study.

6.5. ANIMAL CARE AND HUSBANDRY

6.5.1. FACILITIES MANAGEMENT/ANIMAL HUSBANDRY

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

6.5.2. VETERINARY CARE

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

6.5.3. ENVIRONMENTAL CONDITIONS

Light/Dark Cycle

Twelve hour light/dark cycle provided via automatic timer.

Temperature

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

Humidity

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

6.5.4. HOUSING

Animals of the same sex will be individually housed in suspended, stainless steel wire mesh cages during the study.

6.5.5. FEED

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

6.5.6. WATER

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

6.5.7. FEED ANALYSIS

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

6.5.8. WATER ANALYSIS

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

6.5.9. ANIMAL ASSIGNMENT

More animals than required for the study will be purchased and acclimated. Animals considered suitable for study on the basis of pretest physical examinations, body weight data and any other pretest evaluations, will be randomly assigned to control or treated groups in an attempt to equalize mean group body weights. Individual weights of animals placed on test shall be within ±20% of the mean weight for each sex. Disposition of all animals not utilized in the study will be maintained in the study file.

6.5.10. IDENTIFICATION

Each animal will be assigned a temporary identification number upon receipt. After selection for study, each animal will be tail-tattooed with a number assigned by the Testing Facility. This number plus the study number will comprise the unique animal number for each animal. Each cage will be provided with a cage card which will be color coded for exposure level identification and will contain the study number and animal number.

6.5.11. ANIMAL HUSBANDRY/EXPOSURE

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

7. IN-LIFE EVALUATIONS

7.1. CLINICAL OBSERVATIONS

7.1.1. VIABILITY CHECKS (CAGE-SIDE)

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

7.1.2. PHYSICAL EXAMINATIONS

All animals will be observed as a group at least once during each exposure. This will routinely be performed near the middle of each exposure and may be performed more frequently if significant signs of toxicity are noted.

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

circling) or bizarre behavior (e.g., self-mutilation, walking backward) will be recorded.

7.2. BODY WEIGHTS

Non-fasted body weights for animals will be recorded at least once pretest and once per week during the study period. Fasted weights will be obtained prior to necropsy.

7.3. FEED CONSUMPTION

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

8. POSTMORTEM EVALUATIONS

8.1. MACROSCOPIC PATHOLOGY

A complete macroscopic examination will be performed on all animals, including animals euthanized in a moribund condition or found dead; all abnormal observations will be recorded. The necropsy will consist of an external examination, including identification of all clinically recorded lesions, as well as a detailed internal examination. Special attention should be paid to the organs of the reproduction system.

8.1.1. MORIBUND ANIMALS

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

8.1.2. TERMINAL NECROPSY

Necropsy will be performed on all surviving animals after animals have been treated for at least 14 days. Necropsy schedules will be established in order to assure that approximately equal numbers from each group will be examined at similar times of each day of necropsy.

8.2. METHOD OF EUTHANASIA

Exsanguination following carbon dioxide inhalation.

8.3. ORGAN WEIGHTS

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

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

8.4. TISSUE PRESERVATION

Tissues listed in Appendix A will be obtained at necropsy and preserved for all animals.

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

All other tissues - 10% neutral buffered formalin

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

8.5. MICROSCOPIC PATHOLOGY EVALUATIONS

The lungs from all animals will be examined. No other examinations are required. Authorization will be obtained from the Sponsor prior to performing any additional examinations.

Stains: Standard stains (hematoxylin and eosin) will be used. Special stains may be employed on selected tissues to aid in making a diagnosis at the discretion of the Study Pathologist. Special stains may also be employed at the request of the Sponsor (additional cost).

9. ARCHIVING OF RECORDS AND SPECIMENS

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

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

10. STATISTICAL ANALYSIS

10.1. ITEMS TO BE ANALYZED

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

mean body weight values
mean feed consumption values
mean terminal organ weights, organ/body and organ/brain weight ratios

10.2. PROCEDURES

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

References for these procedures are:

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

11. REPORTING

11.1. STATUS REPORTS

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

11.2. FINAL REPORT

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

Compliance Statement (including Sponsor signature line)
Quality Assurance Statement
Summary
Introduction
Experimental Design

Materials and Methods
Discussion of Study Results
Conclusion (including NOAEL statement, if applicable)
Tables of Exposure Data
Mortality Data
Individual animal termination history
Summary of daily animal observations (as appropriate)
Summary of weekly physical examination data
Tables of mean and individual body weights
Tables of mean and individual feed consumption
Tables of mean and individual organ weights, organ/brain and organ/body weight ratios
Individual and summary tables of macroscopic pathology findings
Individual and summary tables of microscopic pathology findings
References for experimental methodology
Senior personnel participating in the study
Copy of study protocol and associated amendments

12. REGULATORY REFERENCES

12.1. TESTING GUIDELINES

This study is not designed to meet or exceed any regulatory requirements. It is designed to assess the toxicity of the test substance in order to determine exposure levels for a subsequent OECD 421 inhalation study 03-4246.

12.2. GOOD LABORATORY PRACTICES

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

12.3. ANIMAL WELFARE ACT COMPLIANCE

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

1. The Sponsor's signature on this protocol documents that, for the study described, there are no generally accepted non-animal alternatives and the study does not unnecessarily duplicate previous experiments in regard to species, test substance, route of administration or duration of treatment.

2. All procedures used in this study have been designed to avoid discomfort, distress and pain to the animals. All methods are described in this study protocol or written laboratory standard operating procedures.

3. Any procedures outlined in this study which cause more than momentary or slight pain or distress to the animals will be performed with appropriate sedatives, analgesics or anesthetics unless the withholding of these agents is justified for scientific reasons, in writing by the Sponsor and the Study Director, in which case the procedure will continue for the minimum time necessary. Documentation of the justification for withholding treatment for pain or distress and IACUC approval of the procedures will be made prior to study initiation on the IACUC Protocol Review Form.

4. Animals experiencing more than momentary or slight pain or distress due to test substance or injury or illness will be treated by the Testing Facility's veterinary staff with approved analgesics or agents to relieve pain after consultation with the Study Director and Sponsor. However, in emergency situations, the veterinary staff is authorized to administer emergency treatment as necessary. Any subsequent treatment or euthanasia will be administered after consultation with the Study Director. The Sponsor will be advised by the Study Director of all emergency situations in as timely a manner as possible.

5. Methods of euthanasia used during this study are in conformance with the above-referenced regulations.

12.4. INSTITUTIONAL ANIMAL CARE AND USE COMMITTEE (IACUC)

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

13. QUALITY ASSURANCE MONITORING

The Huntingdon Life Sciences Quality Assurance Unit will monitor the facilities, equipment, personnel, methods, practices, records and controls used in this study

to assure that they are in conformance with this protocol, company SOPs, and the appropriate Good Laboratory Practice requirements.

14. ALTERATION IN STUDY DESIGN

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

APPENDIX A
Tissues Preserved

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

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

[a]Bone marrow smears will be prepared and archived. They will only be evaluated (Sponsor approval, additional cost) if needed.

[b]Target organs will be designated by the Study Director, Pathologist and/or Sponsor based on experimental findings.

Protocol Amendment No. 1

Study Title: Petroleum Coke: A 2-Week Range-Finding Inhalation Toxicity Study in the Rat via Nose-Only Exposures

Changes

1. Study Summary, page 2:
Revise Exposure Levels: **Group 2 = 25 ~~5~~ mg/m^3**
Group 3 = 75 ~~20~~ mg/m^3
Group 4 = 200 ~~50~~ mg/m^3

2. Justification for Exposure Level Selection, page 3:
Add as below.

Reasons for Changes

1. and 2. Based on a subsequent re-review of the prior data for the test substance (e.g. slight pulmonary toxicity and body weight effects after 5 days of exposure to 50 mg/m^3) and review of the purpose of this study as a range-finding study for a subsequent reproduction assessment OECD 421 study 03-4246, it was decided that the initially selected high exposure level of 50 mg/m^3 was not high enough to sufficiently assess a maximum tolerated exposure level. Therefore, the high exposure level was increased to 200 mg/m^3 (expected to result in marked pulmonary toxicity and body weight effects). This will result in an essentially 12 times higher exposure than the prior 5 days study since the exposure level will be increased by a factor of 4 (from 50 to 200 mg/m^3) and the duration of the exposures will be increased by a factor of 3 (from 5 to 14 days). The lower exposures levels were also proportionately adjusted.

Amendment approved by:

[redacted]

1 Mar 04
Date

01 MAR 04
Date

[illegible]
Date

03 March 2004
Date

Protocol Amendment No. 2

Study Title: Petroleum Coke: A 2-Week Range-Finding Inhalation Toxicity Study in the Rat via Nose-Only Exposures

Changes

1. Organ Weights, page 11:
Revise: .....seminal vesicles **and prostate**...

2. Statistical Analysis, page 12:
Revise: .....Bartlett's test (.....;**Snedecor, G.W. and Cochran, W.G. 1967. *Statistical Methods*. 6th edition. Ames: Iowa State University Press**) will be performed....

3. Tissues Preserved, page 17:
Revise: ....lymph node (mesenteric and **mediastinal** ~~thoracic~~)...

Reasons for Changes

1. The prostate is also weighed as attached to the seminal vesicles.
2. Clarification of the references for the Bartlett's Test.
3. Clarification of the terminology for the lymph nodes collected at necropsy.

Amendment approved by:

[redacted]

16 June 04
Date

June 17, 2004
Date

	Certificate of Analysis	Appendix L

Analysis Report

Lancaster Laboratories

Lancaster Laboratories Sample No. SW 4073302

Collected:06/26/2003 00:00

Account Number: 10863

Submitted: 06/27/2003 10:40
Reported: 07/09/2003 at 11:42
Discard: 08/09/2003
Pet Coke Micronized Solid Sample
Cost Center# ENG-4066
HPV Petroleum Cake

Chevron Products Company
940 Hensley St. Bldg. 210

Richmond CA 94801

MICPC

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Units	Dilution Factor
07804	PAHs in Soil by GC/MS						
01191	Acenaphthene	83-32-9	N.D.		1,000.	ug/kg	10
01195	Pyrene	129-00-0	8,600.	J	1,000.	ug/kg	10
02751	1-Methylnaphthalene	90-12-0	10,000.		1,000.	ug/kg	10
03761	Naphthalene	91-20-3	11,000.		1,000.	ug/kg	10
03765	Acenaphthylene	208-96-8	N.D.		1,000.	ug/kg	10
03768	Fluorene	86-73-7	1,500.	J	1,000.	ug/kg	10
03775	Phenanthrene	85-01-8	7,800.	J	1,000.	ug/kg	10
03776	Anthracene	120-12-7	3,300.	J	1,000.	ug/kg	10
03778	Fluoranthene	206-44-0	1,400.	J	1,000.	ug/kg	10
03781	Benzo(a)anthracene	56-55-3	7,100.	J	1,000.	ug/kg	10
03782	Chrysene	218-01-9	9,400.	J	1,000.	ug/kg	10
03786	Benzo(b)fluoranthene	205-99-2	3,800.	J	1,000.	ug/kg	10
03787	Benzo(k)fluoranthene	207-08-9	N.D.		1,000.	ug/kg	10
03788	Benzo(a)pyrene	50-32-8	11,000.		1,000.	ug/kg	10
03789	Indeno(1,2,3-cd)pyrene	193-39-5	3,500.	J	1,000.	ug/kg	10
03790	Dibenz(a,h)anthracene	53-70-3	4,100.	J	1,000.	ug/kg	10
03791	Benzo(g,h,i)perylene	191-24-2	8,700.	J	1,000.	ug/kg	10
04694	2-Methylnaphthalene	91-57-6	26,000.		1,000.	ug/kg	10

Due to sample matrix interferences observed during the extraction, the normal reporting limits could not be obtained.

Due to the sample matrix an initial dilution was necessary to perform the analysis. Therefore, the reporting limits for the GC/MS semivolatile compounds were raised.

State of California Lab Certification No. 2116

Laboratory Chronicle

CAT No.	Analysis Name	Method	Analysis Trial#	Analysis Date and Time	Analyst	Dilution Factor
07804	PAHs in Soil by GC/MS	SW-846 8270C	1	07/02/2003 18:34	Susan L Scheuering	10

Analysis Report

Lancaster Laboratories

Lancaster Laboratories Sample No. SW 4073302

Collected:06/26/2003 00:00

Account Number: 10863

Submitted: 06/27/2003 10:40
Reported: 07/09/2003 at 11:42
Discard: 08/09/2003
Pet Coke Micronized Solid Sample
Cost Center# ENG-4066
HPV Petroleum Cake

Chevron Products Company
940 Hensley St. Bldg. 210

Richmond CA 94801

MICPC

07806	BNA Soil Extraction	SW-846 3550B	1	06/30/2003 20:00	Sally L Appleyard	1

	Testing Facility Personnel	Appendix M

TITLE/DEPARTMENT	NAME/DEGREE
SENIOR VICE PRESIDENT, SAFETY ASSESSMENT	[redacted]
DIRECTOR, DEVELOPMENTAL AND REPRODUCTIVE TOXICOLOGY	[redacted]
DIRECTOR, TOXICOLOGY OPERATIONS	[redacted]
DIRECTOR, ANALYTICAL SERVICES	[redacted]
DIRECTOR, QUALITY ASSURANCE	[redacted]
STUDY DIRECTOR	[redacted]
PATHOLOGIST	[redacted]
STUDY MONITOR	[redacted]
VETERINARIAN	[redacted]
MANAGER/SUPERVISOR	
Rodent/Inhalation Toxicology Pharmacy Necropsy Histology	[redacted]

	Report Amendments	Appendix N

There are no amendments for this report at this time.

	Test Article: Analytical	Appendix Y

Test Article: Analytical

Test Article: Analytical Before and After Summary Tables

Concentrations of Selected Metals in Petroleum Coke Sample Analyzed Before and After Toxicology Studies[1, 2]

		Pre-Test Micronized [3]	Post-Test Micronized [3, 4]
	Units	Result	Result
AL	mg/kg	300.2	250.7
AS	mg/kg	<29.61	<2.31246
B	mg/kg	<29.61	
BA	mg/kg	<29.61	6.87
BE	mg/kg	<14.805	
BI	mg/kg	<29.61	
CA	mg/kg	121.6	158.7
CD	mg/kg	<14.805	
CO	mg/kg	<14.805	1.7
CR	mg/kg	<14.805	4.58
CU	mg/kg	<17.766	2.25
FE	mg/kg	247	276.1
K	mg/kg	<44.414	20.5
LI	mg/kg	<14.805	<1.15623
MG	mg/kg	60.85	65.46
MN	mg/kg	<29.61	7.27
MO	mg/kg	<29.61	15.99
NA	mg/kg	114.6	99.03
NI	mg/kg	351.7	304.6
P	mg/kg	30.3	25.01
PB	mg/kg	<29.61	7.38
PD	mg/kg		<6.937379
PT	mg/kg		4.48
S	mg/kg	58060	
SB	mg/kg	<74.024	
SE	mg/kg	<29.61	
SI	mg/kg		204
SN	mg/kg		<2.31246
TI	mg/kg	<14.805	14.35
V	mg/kg	1805	1580
ZN	mg/kg	<14.805	11.19

[1] Analyses performed by ChevronTexaco Energy Technology Company Elemental Spectroscopy Laboratory
[2] Original data and reports stored at ChevronTexaco Energy Technology
[3] Lot number M05369A
[4] Data from the environmental post study analysis

Concentrations of Selected Polyaromatic Hydrocarbon Compounds in Petroleum Coke Sample Analyzed Before and After Toxicology Studies [1]

Analysis Name		Pre-Test Micronized [2]		Post-Test Micronized [2]	
	Units	Result	MDL	Result	MDL
Acenaphthene	ug/kg	N.D.	1,000	690. J	200.
Pyrene	ug/kg	8,600 J	1,000	7,400	200.
1-Methylnaphthalene	ug/kg	10,000	1,000	10,000.	200.
Naphthalene	ug/kg	11,000	1,000	10,000.	200.
Acenaphthylene	ug/kg	N.D.	1,000	N.D.	200.
Fluorene	ug/kg	1,500 J	1,000	1,300. J	200.
Phenanthrene	ug/kg	7,800 J	1,000	7,000	200.
Anthracene	ug/kg	3,300 J	1,000	3,300.	200.
Fluoranthene	ug/kg	1,400 J	1,000	1,300.	200.
Benzo(a)anthracene	ug/kg	7,100 J	1,000	7,800.	200.
Chrysene	ug/kg	9,400 J	1,000	7,900.	200.
Benzo(b)fluoranthene	ug/kg	3,800 J	1,000	3,900.	200.
Benzo(k)fluoranthene	ug/kg	N.D.	1,000	1,600.	200.
Benzo(a)pyrene	ug/kg	11,000	1,000	13,000.	200.
Indeno(1,2,3-cd)pyrene	ug/kg	3,500 J	1,000	3,600.	200.
Dibenz(a,h)anthracene	ug/kg	4,100 J	1,000	4,700.	200.
Benzo(g,h,i)perylene	ug/kg	8,700 J	1,000	14,000.	200.
2-Methylnaphthalene	ug/kg	26,000	1,000	27,000.	1000

[1] Analysis performed by Lancaster Laboratories
[2] Lot number M05369A

Laboratory Report for Concentrations of Selected Metals in Petroleum Coke Samples Analyzed Before Toxicology Studies

Laboratory Report for Concentrations of Selected Metals in Petroleum Coke Samples Analyzed Before Toxicology Studies

CHEVRONTEXACO ENERGY TECHNOLOGY COMPANY
ELEMENTAL SPECTROSCOPY LABORATORY
PROJECT SUMMARY

For:	Patrick Beatty	Location:	Richmond
Phone:	CTN242-7037	Reported:	February 18, 2004

1. Project Title:
Determination of metals by microwave digestion and ICP-AES (modified EPA Methods)

2. Sample Description:
Petroleum coke

3. Analytical Approach:
Conventional ashing and air-refluxing methods have been widely used in Petroleum industry analytical laboratories for many years. These traditional methods are always time-consuming, labor-intensive, tedious, and cumbersome. Additionally, contamination or loss is very likely to occur from the acids (especially sulfuric acid) and/or vessels used during the sample preparation. Moreover, sulfur determination may not be achieved because sulfuric acid is always used in these methods.

Utilizing a high pressure microwave system, many innovative and rapid analytical methods were developed in our atomic spectroscopy lab recently. The high operating temperature and pressure attainable in this microwave digestion system ensures total decomposition of complex petroleum crudes and petrochemical products, with no residual organic content. Sample preparation time has been shortened from days (or, in some cases, even more than a week) to minutes. Our analytical methods can now also be applied to the determination of metals in crudes and polymer samples because sulfuric acid is no longer required in the microwave digestion process. The microwave digestion system also eliminates contamination previously due to the use of more traditional digestion vessels, and from airborne particulates in the lab environment.

Samples were digested by modified EPA 3052 (closed vessel microwave digestion) and analyzed by modified EPA 6010 (ICP-AES).

4. Analytical Results:

3030999 PETROLEUM COKE 2NM

MICROWAVE DIGST/ICP PLUS REPORTED					
AL	300.200 PPM	AS	<29.61 PPM	B	<29.61 PPM
BA	<29.61 PPM	BE	<14.805 PPM	BI	<29.61 PPM
CA	121.600 PPM	CD	<14.805 PPM	CO	<14.805 PPM
CR	<14.805 PPM	CU	<17.766 PPM	FE	247.000 PPM
K	<44.414 PPM	LI	<14.805 PPM	MG	60.850 PPM
MN	<29.61 PPM	MO	<29.61 PPM	NA	114.600 PPM
NI	351.700 PPM	P	30.300 PPM	PB	<29.61 PPM
S	58060.000 PPM	SB	<74.024 PPM	SE	<29.61 PPM
SI	554.600 PPM	SN	<44.414 PPM	TI	<14.805 PPM
V	1805.000 PPM	ZN	<14.805 PPM		

3030251 PETROLEUM COKE

MICROWAVE DIGST/ICP PLUS REPORTED					
AL	321.000 PPM	AS	<19.279 PPM	B	<19.279 PPM
BA	<19.279 PPM	BE	<9.639 PPM	BI	<19.279 PPM
CA	178.000 PPM	CD	<9.639 PPM	CO	<9.639 PPM
CR	<9.639 PPM	CU	<11.567 PPM	FE	310.000 PPM
K	<28.918 PPM	LI	<9.639 PPM	MG	77.370 PPM
MN	<19.279 PPM	MO	<19.279 PPM	NA	133.000 PPM
NI	367.100 PPM	P	<19.279 PPM	PB	<19.279 PPM
S	73920 PPM	SB	<48.197 PPM	SE	<19.279 PPM
SI	743.200 PPM	SN	<28.918 PPM	TI	12.910 PPM
V	1938.000 PPM	ZN	12.010 PPM		

Analyzed and Reported by: J. David Hwang and David Leong

Laboratory Report for Concentrations of Selected Metals in Petroleum Coke Samples Analyzed After Toxicology Studies

Concentration of Selected Metals in Petroleum Coke Samples Analyzed After Toxicology Studies[3,4,5]

	WIL6485A (2 mm)[1]	WIL6484A (3.3 micron)[2]
AL	205.1	250.7
AS	<2.306273	<2.31246
BA	7.74	6.87
CA	81.73	158.7
CO	1.9	1.7
CR	3.94	4.58
CU	1.83	2.25
FE	215.9	276.1
K	10.91	20.5
LI	<1.153137	<1.15623
MG	50.34	65.46
MN	5.31	7.27
MO	16.58	15.99
NA	87.84	99.03
NI	319.6	304.6
P	19.75	25.01
PB	4.88	7.38
PD	<6.918819	<6.937379
PT	3.81	4.48
SI	86.75	204
SN	<2.306273	<2.31246
TI	11.66	14.35
V	1559.00	1580
ZN	8.87	11.19

[1] Also identified as "pellet" petcoke; lot number M05369B

[2] Also identified as micronized petcoke; lot number M05369A

[3] Samples were shipped from Wildlife International to ChevronTexaco Energy Technology Company Elemental Spectroscopy Laboratory

[4] Samples were digested by modified EPA 3052 (closed vessel microwave digestion) and analyzed by modified EPA 6010 (ICP-AES)

[5] Original data stored at ChevronTexaco Energy Technology Company

Protocol Amendment No. 5

Study Title: Petroleum Coke: Reproduction/Developmental Toxicity Screening Study in Rats via Nose-Only Inhalation Exposures

Changes

Identification of Test Substance, page 5:
Revise: At the end of the study, a 200 gram sample of the test substance will be shipped for analysis to ChevronTexaco Energy Research and Technology Corp., 100 Chevron Way, Richmond, CA 94802, 510-242-7037, attn: Patrick Beatty. **Since this analysis was not conducted using the same methods as the pre-study analysis and therefore was not valid for a comparison to the pre-study data, the data from an analysis of a sample from the same lot number stored at Wildlife International will instead be reported for this study.**

Reasons for Changes

Clarification of the data to be reported for test substance stability analysis.

Additional Cost Required: No

Amendment approved by:

[redacted]

4/16/2008
Date

4/16/2008
Date

Not used for pre and post study stability assessment due to deviation in Chevron analysis (calcinated) rendering the results inappropriate for comparison to original data

CHEVRONTEXACO ENERGY TECHNOLOGY COMPANY
ELEMENTAL SPECTROSCOPY LABORATORY
PROJECT SUMMARY

For: [redacted] Location: Richmond
Phone: CTN242-7038 Reported: February 7, 2006

1. Project Title:
Determination of metals by microwave digestion and ICP-AES (modified EPA Methods)

2. Sample Description:
Petroleum coke

3. Analytical Approach:
Conventional ashing and air-refluxing methods have been widely used in Petroleum industry analytical laboratories for many years. These traditional methods are always time-consuming, labor-intensive, tedious, and cumbersome. Additionally, contamination or loss is very likely to occur from the acids (especially sulfuric acid) and/or vessels used during the sample preparation. Moreover, sulfur determination may not be achieved because sulfuric acid is always used in these methods.

Utilizing a high pressure microwave system, many innovative and rapid analytical methods were developed in our atomic spectroscopy lab recently. The high operating temperature and pressure attainable in this microwave digestion system ensures total decomposition of complex petroleum crudes and petrochemical products, with no residual organic content. Sample preparation time has been shortened from days (or, in some cases, even more than a week) to minutes. Our analytical methods can now also be applied to the determination of metals in crudes and polymer samples because sulfuric acid is no longer required in the microwave digestion process. The microwave digestion system also eliminates contamination previously due to the use of more traditional digestion vessels, and from airborne particulates in the lab environment.

The sample was calcinated at 600 °C for 3 hours and then digested by modified EPA 3052 (closed vessel microwave digestion) and analyzed by modified EPA 6010 (ICP-AES).

4. Analytical Results:

AL	40360	PPM
AS	<185.642	PPM
BA	1008	PPM
BI	<185.642	PPM
CA	22650	PPM
B	<185.642	PPM
CO	241	PPM
CR	708	PPM
CU	303	PPM
FE	35720	PPM
K	3216	PPM
BE	<92.821	PPM
LI	155	PPM
MG	8936	PPM
MN	1085	PPM
MO	2137	PPM
NA	14510	PPM
CD	<92.821	PPM
NI	43500	PPM
P	2056	PPM
PB	1035	PPM
S	15240	PPM
SB	<464.105	PPM

SE	<185.642	PPM
SI	32000	PPM
SN	<185.642	PPM
TI	1686	PPM
V	233600	PPM
ZN	1497	PPM

Analyzed and Reported by: [redacted]

Laboratory Report for Concentrations of Selected Polyaromatic Hydrocarbon Compounds in Petroleum Coke Sample Analyzed Before Mammalian Toxicology Studies

Analysis Report

Lancaster Laboratories

ANALYTICAL RESULTS

Prepared for:

Chevron Products Company
940 Hensley St. Bldg. 210

Richmond CA 94801
510-242-8191

Prepared by:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

SAMPLE GROUP

The sample group for this submittal is 857532. Samples arrived at the laboratory on Friday, June 27, 2003. The PO# for this group is 99011184 and the release number is BEATTY.

Client Description	Lancaster Labs Number
Pet Coke 2mm Solid Sample	4073301
Pet Coke Micronized Solid Sample	4073302

1 COPY TO Lancaster Laboratories
1 COPY TO Chevron CRTC

[redacted]

Questions? Contact your Client Services Representative
Alison M O'Connor at (717) 656-2300.

Respectfully Submitted,

[redacted]

1

A4200

3.66

Analysis Report

Lancaster Laboratories

Lancaster Laboratories Sample No. SW 4073302

Collected:06/26/2003 00:00

Account Number: 10863

Submitted: 06/27/2003 10:40
Reported: 07/09/2003 at 11:42
Discard: 08/09/2003
Pet Coke Micronized Solid Sample
Cost Center# ENG-4066
HPV Petroleum Cake

Chevron Products Company
940 Hensley St. Bldg. 210

Richmond CA 94801

MICPC

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Units	Dilution Factor
07804	PAHs in Soil by GC/MS						
01191	Acenaphthene	83-32-9	N.D.		1,000.	ug/kg	10
01195	Pyrene	129-00-0	8,600.	J	1,000.	ug/kg	10
02751	1-Methylnaphthalene	90-12-0	10,000.		1,000.	ug/kg	10
03761	Naphthalene	91-20-3	11,000.		1,000.	ug/kg	10
03765	Acenaphthylene	208-96-8	N.D.		1,000.	ug/kg	10
03768	Fluorene	86-73-7	1,500.	J	1,000.	ug/kg	10
03775	Phenanthrene	85-01-8	7,800.	J	1,000.	ug/kg	10
03776	Anthracene	120-12-7	3,300.	J	1,000.	ug/kg	10
03778	Fluoranthene	206-44-0	1,400.	J	1,000.	ug/kg	10
03781	Benzo(a)anthracene	56-55-3	7,100.	J	1,000.	ug/kg	10
03782	Chrysene	218-01-9	9,400.	J	1,000.	ug/kg	10
03786	Benzo(b)fluoranthene	205-99-2	3,800.	J	1,000.	ug/kg	10
03787	Benzo(k)fluoranthene	207-08-9	N.D.		1,000.	ug/kg	10
03788	Benzo(a)pyrene	50-32-8	11,000.		1,000.	ug/kg	10
03789	Indeno(1,2,3-cd)pyrene	193-39-5	3,500.	J	1,000.	ug/kg	10
03790	Dibenz(a,h)anthracene	53-70-3	4,100.	J	1,000.	ug/kg	10
03791	Benzo(g,h,i)perylene	191-24-2	8,700.	J	1,000.	ug/kg	10
04694	2-Methylnaphthalene	91-57-6	26,000.		1,000.	ug/kg	10

Due to sample matrix interferences observed during the extraction, the normal reporting limits could not be obtained.

Due to the sample matrix an initial dilution was necessary to perform the analysis. Therefore, the reporting limits for the GC/MS semivolatile compounds were raised.

State of California Lab Certification No. 2116

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
07804	PAHs in Soil by GC/MS	SW-846 8270C	1	07/02/2003 18:34	Susan L Scheuering	10

Analysis Report

Lancaster Laboratories

Lancaster Laboratories Sample No. SW 4073302

Collected:06/26/2003 00:00

Account Number: 10863

Submitted: 06/27/2003 10:40
Reported: 07/09/2003 at 11:42
Discard: 08/09/2003
Pet Coke Micronized Solid Sample
Cost Center# ENG-4066
HPV Petroleum Cake

Chevron Products Company
940 Hensley St, Bldg. 210

Richmond CA 94801

MICPC

07806	BNA Soil Extraction	SW-846 3550B	1	06/30/2003 20:00	Sally L Appleyard	1

MEMBER
Lancaster Laboratories, Inc.
2425 New Holland Pike
PO Box 12425
Lancaster PA 17605-2425

Analysis Report

Lancaster Laboratories

Lancaster Laboratories Sample No. SW 4073301

Collected:06/26/2003 00:00

Account Number: 10863

Submitted: 06/27/2003 10:40
Reported: 07/09/2003 at 11:42
Discard: 08/09/2003
Pet Coke 2mm Solid Sample
Cost Center# ENG-4066
HPV Petroleum Cake

Chevron Products Company
940 Hensley St. Bldg. 210

Richmond CA 94801

2MMPC

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Units	Dilution Factor
07804	PAHs in Soil by GC/MS						
01191	Acenaphthene	83-32-9	N.D.		330.	ug/kg	10
01195	Pyrene	129-00-0	1,300.	J	330.	ug/kg	10
02751	1-Methylnaphthalene	90-12-0	2,700.	J	330.	ug/kg	10
03761	Naphthalene	91-20-3	3,600.		330.	ug/kg	10
03765	Acenaphthylene	208-96-8	N.D.		330.	ug/kg	10
03768	Fluorene	86-73-7	340.	J	330.	ug/kg	10
03775	Phenanthrene	85-01-8	690.	J	330.	ug/kg	10
03776	Anthracene	120-12-7	N.D.		330.	ug/kg	10
03778	Fluoranthene	206-44-0	N.D.		330.	ug/kg	10
03781	Benzo(a)anthracene	56-55-3	580.	J	330.	ug/kg	10
03782	Chrysene	218-01-9	880.	J	330.	ug/kg	10
03786	Benzo(b)fluoranthene	205-99-2	520.	J	330.	ug/kg	10
03787	Benzo(k)fluoranthene	207-08-9	N.D.		330.	ug/kg	10
03788	Benzo(a)pyrene	50-32-8	1,800.	J	330.	ug/kg	10
03789	Indeno(1,2,3-cd)pyrene	193-39-5	340.	J	330.	ug/kg	10
03790	Dibenz(a,h)anthracene	53-70-3	490.	J	330.	ug/kg	10
03791	Benzo(g,h,i)perylene	191-24-2	1,100.	J	330.	ug/kg	10
04694	2-Methylnaphthalene	91-57-6	11,000.		330.	ug/kg	10

Due to the sample matrix an initial dilution was necessary to perform the analysis. Therefore, the reporting limits for the GC/MS semivolatile compounds were raised.

State of California Lab Certification No. 2116

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
07804	PAHs in Soil by GC/MS	SW-846 8270C	1	07/02/2003 15:41	Susan L Schoonring	10
07806	DNA Soil Extraction	SW-846 3550B	1	06/30/2003 20:00	Sally L Appleyard	1

MEMBER

Lancaster Laboratories, Inc.
2425 New Holland Pike
PO Box 12425
Lancaster PA 17605-2425

Analysis Report

Lancaster Laboratories

Quality Control Summary

Client Name: Chevron Products Company Group Number: 857532
Reported: 07/09/03 at 11:42 AM

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 03181SLA026	Sample number(s): 4073301-4073302							
Acenaphthene	N.D.	33.	ug/kg	91		76-109		
Pyrene	N.D.	33.	ug/kg	89		71-110		
1-Methylnaphthalene	N.D.	33.	ug/kg	87		76-101		
Naphthalene	N.D.	33.	ug/kg	87		73-103		
Acenaphthylene	N.D.	33.	ug/kg	94		73-106		
Fluorene	N.D.	33.	ug/kg	93		66-115		
Phenanthrene	N.D.	33.	ug/kg	88		70-107		
Anthracene	N.D.	33.	ug/kg	86		71-107		
Fluoranthene	N.D.	33.	ug/kg	90		69-107		
Benzo(a)anthracene	N.D.	33.	ug/kg	93		74-107		
Chrysene	N.D.	33.	ug/kg	89		72-109		
Benzo(b)fluoranthene	N.D.	33.	ug/kg	95		71-113		
Benzo(k)fluoranthene	N.D.	33.	ug/kg	97		75-112		
Benzo(a)pyrene	N.D.	33.	ug/kg	94		79-111		
Indeno(1,2,3-cd)pyrene	N.D.	33.	ug/kg	88		74-113		
Dibenz(a,h)anthracene	N.D.	33.	ug/kg	95		81-118		
Benzo(g,h,i)perylene	N.D.	33.	ug/kg	92		74-114		
2-Methylnaphthalene	N.D.	33.	ug/kg	90		70-102		

Sample Matrix Quality Control

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: 03181SLA026	Sample number(s): 4073301-4073302								
Acenaphthene	107	93	48-132	14	30				
Pyrene	82	68	28-144	12	30				
1-Methylnaphthalene	75	67*	72-100	5	30				
Naphthalene	77	61	38-132	9	30				
Acenaphthylene	108	91	46-128	18	30				
Fluorene	88	75	39-137	14	30				
Phenanthrene	88	74	29-143	13	30				
Anthracene	101	85	35-138	17	30				
Fluoranthene	81	72	19-148	11	30				
Benzo(a)anthracene	89	75	26-144	14	30				
Chrysene	101	90	23-150	9	30				
Benzo(b)fluoranthene	90	74	32-140	16	30				
Benzo(k)fluoranthene	103	88	36-143	16	30				
Benzo(a)pyrene	90	72	23-154	13	30				
Indeno(1,2,3-cd)pyrene	92	78	13-155	15	30				
Dibenz(a,h)anthracene	110	88	19-169	19	30				
Benzo(g,h,i)perylene	99	83	17-152	13	30				
2-Methylnaphthalene	38	19*	32-133	6	30				

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The background result was more than four times the spike added.

Analysis Report

Lancaster Laboratories

Quality Control Summary

Client Name: Chevron Products Company Group Number: 857532
Reported: 07/09/03 at 11:42 AM

Sample Matrix Quality Control

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max

Surrogate Quality Control

Analysis Name: PAHs in Soil by GC/MS
Batch number: 031818LA026

	Nitrobenzene-d5	2-Fluorobiphenyl	Terphenyl-d14
4073301	101	108	92
4073302	101	99	84
Blank	87	85	83
LCS	94	92	93
MS	105	107	88
MSD	90	90	78
Limits:	47-128	55-123	39-128

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The background result was more than four times the spike added.

Laboratory Report for Concentrations of Selected Polyaromatic Hydrocarbon Compounds in Petroleum Coke Sample Analyzed after Mammalian Toxicology Studies

Analysis Report

Lancaster Laboratories

ANALYTICAL RESULTS

Prepared for:

Chevron Products Company
940 Hensley St. Bldg. 210

Richmond CA 94801
510-242-8191

Prepared by:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

SAMPLE GROUP

The sample group for this submittal is 927702. Samples arrived at the laboratory on Tuesday, January 11, 2005. The PO# for this group is 0015000452 and the release number is RUSSELL WHITE.

Client Description	Lancaster Labs Number
Pet Cake Micronized Post Study Grab Solid Sample	4443909

1 COPY TO	Lancaster Laboratories	[redacted]
1 COPY TO	Chevron CRTC	

Questions? Contact your Client Services Representative
Andres Amaya at (717) 656-2300.

Respectfully Submitted,

[redacted]

Analysis Report

Lancaster Laboratories

Lancaster Laboratories Sample No. SW 4443909

Pet Cake Micronized Post Study Grab Solid Sample
Cost Center#
HPV Petroleum Cake
Collected:11/08/2004

Account Number: 10863

Submitted: 01/11/2005 09:00
Reported: 01/24/2005 at 14:00
Discard: 02/24/2005

Chevron Products Company
940 Hensley St. Bldg. 210

Richmond CA 94801

PETCA

CAT No.	Analysis Name	CAS Number	As Received Result		As Received Method Detection Limit	Units	Dilution Factor
07804	PAHs in Soil by GC/MS						
01191	Acenaphthene	83-32-9	690.	J	200.	ug/kg	1
01195	Pyrene	129-00-0	7,400.		200.	ug/kg	1
02751	1-Methylnaphthalene	90-12-0	10,000.		200.	ug/kg	1
03761	Naphthalene	91-20-3	10,000.		200.	ug/kg	1
03765	Acenaphthylene	208-96-8	N.D.		200.	ug/kg	1
03768	Fluorene	86-73-7	1,300.	J	200.	ug/kg	1
03775	Phenanthrene	85-01-8	7,000.		200.	ug/kg	1
03776	Anthracene	120-12-7	3,300.		200.	ug/kg	1
03778	Fluoranthene	206-44-0	1,300.	J	200.	ug/kg	1
03781	Benzo(a)anthracene	56-55-3	7,800.		200.	ug/kg	1
03782	Chrysene	218-01-9	7,900.		200.	ug/kg	1
03786	Benzo(b)fluoranthene	205-99-2	3,900.		200.	ug/kg	1
03787	Benzo(k)fluoranthene	207-08-9	1,600.	J	200.	ug/kg	1
03788	Benzo(a)pyrene	50-32-8	13,000.		200.	ug/kg	1
03789	Indeno(1,2,3-cd)pyrene	193-39-5	3,600.		200.	ug/kg	1
03790	Dibenz(a,h)anthracene	53-70-3	4,700.		200.	ug/kg	1
03791	Benzo(g,h,i)perylene	191-24-2	14,000.		200.	ug/kg	1
04694	2-Methylnaphthalene	91-57-6	27,000.		1,000.	ug/kg	5

Due to insufficient sample, the reporting limits for the GC/MS semivolatile compounds were raised.

State of California Lab Certification No. 2116

Laboratory Chronicle

CAT No.	Analysis Name	Method	Trial#	Analysis Date and Time	Analyst	Dilution Factor
07804	PAHs in Soil by GC/MS	SW-846 8270C	1	01/13/2005 03:29	Ryan P Byrne	1
07804	PAHs in Soil by GC/MS	SW-846 8270C	1	01/13/2005 06:00	Ryan P Byrne	5
07806	BNA Soil Extraction	SW-846 3550B	1	01/12/2005 16:30	Ashley B Zook	1

MEMBER ACIL
Lancaster Laboratories, Inc.
2425 New Holland Pike
PO Box 12425
Lancaster, PA 17605-2425
717-656-2300 Fax: 717-656-2681

Analysis Request/ Environmental Services Chain of Custody

Lancaster Laboratories

For Lancaster Laboratories use only

Acct. # 10803 Group# 92702 Sample # 4443909 **COC #** 011005-13

Please print. Instructions on reverse side correspond with circled numbers.

(1) Client: [redacted] Acct. #: 10863

Project Name/#: HPV Petroleum Coke PWSID #:

Project Manager: P.O.#: 99011184

Sampler: Quote #:

Name of state where samples were collected: CA

For Lab Use Only
FSC:
SCR #:

(2) Sample Identification	Date Collected	Time Collected	(3) Grab	Composite	(4) Matrix: Soil	Water	Other (Potable / NPDES Check if Applicable)	Total # of Containers	(5) Analyses Requested: Type Here..... PAHs by 8270	Type Here.....	Type Here.....	Type Here.....	Type Here.....	Type Here.....	Type Here.....	Type Here.....	Remarks	(6) Temperature of samples upon receipt (if requested)
Pet Coke Micronized - Post Study	11-8-04		X					1									[redacted]	
																	232-7038	

(7) **Turnaround Time Requested (TAT)** (please circle): Normal Rush
(Rush TAT is subject to Lancaster Laboratories approval and surcharge.)
Date results are needed:
Rush results requested by (please circle): Phone Fax E-mail
Phone #: Fax #:
E-mail address:

(8) **Data Package Options** (please circle if required)
QC Summary Type VI (Raw Data)
Type I (Tier I) GLP
Type II (Tier II) Other
Type III (NJ Red. Del.)
Type IV (CLP)
SDG Complete? Yes No
Site-specific QC required? Yes No
(If yes, indicate QC sample and submit triplicate volume.)
Internal Chain of Custody required? Yes No

Relinquished by:	Date	Time	Received by:	Date	Time
[redacted]	11-10-05	2:50 pm	[redacted]	11-05	1450
[redacted]	11/10/05	1530	Fed Ex	11-05	
			[redacted]	11/05	0900

(9)

Lancaster Laboratories, Inc., 2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 (717) 656-2300
Copies: White and yellow should accompany samples to Lancaster Laboratories. The pink copy should be retained by the client.

2102 Rev. 6/6/03

	Certificates of Analysis	Appendix Z

LabDiet PMI NUTRITION INTERNATIONAL

Return to Certified Analysis Retrieval

Product Code: 5002M
Product Desc: CERTIFIED RODENT DIET MEAL
Lab Number: L0413099-2
Lot Code: FEB 25 04 1B
Entered: 3/9/2004

Assay	Analysis	Units
PROTEIN	20.8	%
FAT ACID (HYDRO.)	5.34	%
FIBER (CRUDE)	4.93	%
ARSENIC	LESS THAN 0.2	PPM
CADMIUM	0.051	PPM
CALCIUM	0.879	%
LEAD	0.172	PPM
MERCURY	LESS THAN 0.025	PPM
PHOSPHORUS	0.634	%
SELENIUM	0.300	PPM

ORGANOPHOSPHATES	PPM	ORGANOPHOSPHATES	PPM
Diazinon	LESS THAN 0.02	Disulfoton	LESS THAN 0.02
Ethion	LESS THAN 0.02	Malathion	LESS THAN 0.02
Methyl Parathion	LESS THAN 0.02	Parathion	LESS THAN 0.02
Thimet	LESS THAN 0.02	Thiodan	LESS THAN 0.02
Trithion	LESS THAN 0.02		

PESTICIDES AND PCB	PPM	PESTICIDES AND PCB	PPM
Aldrin	LESS THAN 0.02	Alpha-BHC	LESS THAN 0.02
Beta-BHC	LESS THAN 0.02	Chlordane	LESS THAN 0.02
DDE	LESS THAN 0.02	DDT	LESS THAN 0.02
Delta-BHC	LESS THAN 0.02	Dieldrin	LESS THAN 0.02
Endrin	LESS THAN 0.02	HCB	LESS THAN 0.02
Heptachlor	LESS THAN 0.02	Heptachlor Epoxide	LESS THAN 0.02
Lindane	LESS THAN 0.02	Methoxychlor	LESS THAN 0.02

Mirex	LESS THAN 0.02	PCB	LESS THAN 0.15
AFLATOXINS	Aflatoxins	LESS THAN 5 PPB	

No notes.
For additional information, please contact:
1) Customer Service at (314) 982-1310 -- for assay methodology
2) Dr. Dorrance Haught at (314) 768-4362 -- for nutritional interpretation
3) Richmond, IN Manufacturing Plant at (765) 962-9561 -- all other questions

The term "Less Than" is used to signify the lower limit of quantitation of the procedure under the conditions employed. The use of the term "Less Than" does not imply that traces of analyte were present.

LabDiet PMI NUTRITION INTERNATIONAL

Return to Certified Analysis Retrieval

Product Code: 5002M
Product Desc: CERTIFIED RODENT DIET MEAL
Lab Number: L0413666-3
Lot Code: MAR 08 04 1B
Entered: 3/22/2004

Assay	Analysis	Units
PROTEIN	20.8	%
FAT ACID (HYDRO.)	5.42	%
FIBER (CRUDE)	4.37	%
ARSENIC	LESS THAN 0.2	PPM
CADMIUM	LESS THAN 0.05	PPM
CALCIUM	0.926	%
LEAD	0.181	PPM
MERCURY	LESS THAN 0.025	PPM
PHOSPHORUS	0.702	%
SELENIUM	0.440	PPM

ORGANOPHOSPHATES	PPM	ORGANOPHOSPHATES	PPM
Diazinon	LESS THAN 0.02	Disulfoton	LESS THAN 0.02
Ethion	LESS THAN 0.02	Malathion	LESS THAN 0.02
Methyl Parathion	LESS THAN 0.02	Parathion	LESS THAN 0.02
Thimet	LESS THAN 0.02	Thiodan	LESS THAN 0.02
Trithion	LESS THAN 0.02		

PESTICIDES AND PCB	PPM	PESTICIDES AND PCB	PPM
Aldrin	LESS THAN 0.02	Alpha-BHC	LESS THAN 0.02
Beta-BHC	LESS THAN 0.02	Chlordane	LESS THAN 0.02
DDE	LESS THAN 0.02	DDT	LESS THAN 0.02
Delta-BHC	LESS THAN 0.02	Dieldrin	LESS THAN 0.02
Endrin	LESS THAN 0.02	HCB	LESS THAN 0.02
Heptachlor	LESS THAN 0.02	Heptachlor Epoxide	LESS THAN 0.02
Lindane	LESS THAN 0.02	Methoxychlor	LESS THAN 0.02

Mirex	LESS THAN 0.02	PCB	LESS THAN 0.15
AFLATOXINS	Aflatoxins	LESS THAN 5 PPB	

No notes.
For additional information, please contact:
1) Customer Service at (314) 982-1310 -- for assay methodology
2) Dr. Dorrance Haught at (314) 768-4362 -- for nutritional interpretation
3) Richmond, IN Manufacturing Plant at (765) 962-9561 -- all other questions

The term "Less Than" is used to signify the lower limit of quantitation of the procedure under the conditions employed. The use of the term "Less Than" does not imply that traces of analyte were present.

LabDiet PMI NUTRITION INTERNATIONAL

Return to Certified Analysis Retrieval

Product Code: 5002M
Product Desc: CERTIFIED RODENT DIET MEAL
Lab Number: L0416157-1
Lot Code: APR 21 04 3A
Entered: 5/4/2004

Assay	Analysis	Units
PROTEIN	21	%
FAT ACID (HYDRO.)	6.06	%
FIBER (CRUDE)	4.25	%
ARSENIC	LESS THAN 0.2	PPM
CADMIUM	0.055	PPM
CALCIUM	0.831	%
LEAD	0.240	PPM
MERCURY	LESS THAN 0.025	PPM
PHOSPHORUS	0.642	%
SELENIUM	0.239	PPM

ORGANOPHOSPHATES	PPM	ORGANOPHOSPHATES	PPM
Diazinon	LESS THAN 0.02	Disulfoton	LESS THAN 0.02
Ethion	LESS THAN 0.02	Malathion	0.02
Methyl Parathion	LESS THAN 0.02	Parathion	LESS THAN 0.02
Thimet	LESS THAN 0.02	Thiodan	LESS THAN 0.02
Trithion	LESS THAN 0.02		

PESTICIDES AND PCB	PPM	PESTICIDES AND PCB	PPM
Aldrin	LESS THAN 0.02	Alpha-BHC	LESS THAN 0.02
Beta-BHC	LESS THAN 0.02	Chlordane	LESS THAN 0.02
DDE	LESS THAN 0.02	DDT	LESS THAN 0.02
Delta-BHC	LESS THAN 0.02	Dieldrin	LESS THAN 0.02
Endrin	LESS THAN 0.02	HCB	LESS THAN 0.02
Heptachlor	LESS THAN 0.02	Heptachlor Epoxide	LESS THAN 0.02
Lindane	LESS THAN 0.02	Methoxychlor	LESS THAN 0.02

Mirex	LESS THAN 0.02	PCB	LESS THAN 0.15
AFLATOXINS	Aflatoxins	LESS THAN 5 PPB	

No notes.
For additional information, please contact:
1) Customer Service at (314) 982-1310 -- for assay methodology
2) Dr. Dorrance Haught at (314) 768-4362 -- for nutritional interpretation
3) Richmond, IN Manufacturing Plant at (765) 962-9561 -- all other questions

The term "Less Than" is used to signify the lower limit of quantitation of the procedure under the conditions employed. The use of the term "Less Than" does not imply that traces of analyte were present.

LabDiet PMI NUTRITION INTERNATIONAL

Return to Certified Analysis Retrieval

Product Code: 5002M
Product Desc: CERTIFIED RODENT DIET MEAL
Lab Number: L0416157-3
Lot Code: APR 21 04 3C
Entered: 5/4/2004

Assay	Analysis	Units
PROTEIN	21.4	%
FAT ACID (HYDRO.)	5.82	%
FIBER (CRUDE)	4.4	%
ARSENIC	LESS THAN 0.2	PPM
CADMIUM	0.058	PPM
CALCIUM	0.898	%
LEAD	0.233	PPM
MERCURY	LESS THAN 0.025	PPM
PHOSPHORUS	0.651	%
SELENIUM	0.225	PPM

ORGANOPHOSPHATES	PPM	ORGANOPHOSPHATES	PPM
Diazinon	LESS THAN 0.02	Disulfoton	LESS THAN 0.02
Ethion	LESS THAN 0.02	Malathion	0.03
Methyl Parathion	LESS THAN 0.02	Parathion	LESS THAN 0.02
Thimet	LESS THAN 0.02	Thiodan	LESS THAN 0.02
Trithion	LESS THAN 0.02		

PESTICIDES AND PCB	PPM	PESTICIDES AND PCB	PPM
Aldrin	LESS THAN 0.02	Alpha-BHC	LESS THAN 0.02
Beta-BHC	LESS THAN 0.02	Chlordane	LESS THAN 0.02
DDE	LESS THAN 0.02	DDT	LESS THAN 0.02
Delta-BHC	LESS THAN 0.02	Dieldrin	LESS THAN 0.02
Endrin	LESS THAN 0.02	HCB	LESS THAN 0.02
Heptachlor	LESS THAN 0.02	Heptachlor Epoxide	LESS THAN 0.02
Lindane	LESS THAN 0.02	Methoxychlor	LESS THAN 0.02

Mirex	LESS THAN 0.02	PCB	LESS THAN 0.15
AFLATOXINS	Aflatoxins	LESS THAN 5 PPB	

No notes.
For additional information, please contact:
1) Customer Service at (314) 982-1310 -- for assay methodology
2) Dr. Dorrance Haught at (314) 768-4362 -- for nutritional interpretation
3) Richmond, IN Manufacturing Plant at (765) 962-9561 -- all other questions

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LabDiet PMI NUTRITION INTERNATIONAL

Return to Certified Analysis Retrieval

Product Code: 5002M
Product Desc: CERTIFIED RODENT DIET MEAL
Lab Number: L0416691-2
Lot Code: APR 30 04 2B
Entered: 5/18/2004

Assay	Analysis	Units
PROTEIN	20.9	%
FAT ACID (HYDRO.)	5.61	%
FIBER (CRUDE)	4.52	%
ARSENIC	0.393	PPM
CADMIUM	0.056	PPM
CALCIUM	0.869	%
LEAD	0.173	PPM
MERCURY	LESS THAN 0.025	PPM
PHOSPHORUS	0.645	%
SELENIUM	0.257	PPM

ORGANOPHOSPHATES	PPM	ORGANOPHOSPHATES	PPM
Diazinon	LESS THAN 0.02	Disulfoton	LESS THAN 0.02
Ethion	LESS THAN 0.02	Malathion	0.03
Methyl Parathion	LESS THAN 0.02	Parathion	LESS THAN 0.02
Thimet	LESS THAN 0.02	Thiodan	LESS THAN 0.02
Trithion	LESS THAN 0.02		

PESTICIDES AND PCB	PPM	PESTICIDES AND PCB	PPM
Aldrin	LESS THAN 0.02	Alpha-BHC	LESS THAN 0.02
Beta-BHC	LESS THAN 0.02	Chlordane	LESS THAN 0.02
DDE	LESS THAN 0.02	DDT	LESS THAN 0.02
Delta-BHC	LESS THAN 0.02	Dieldrin	LESS THAN 0.02
Endrin	LESS THAN 0.02	HCB	LESS THAN 0.02
Heptachlor	LESS THAN 0.02	Heptachlor Epoxide	LESS THAN 0.02
Lindane	LESS THAN 0.02	Methoxychlor	LESS THAN 0.02

Mirex	LESS THAN 0.02	PCB	LESS THAN 0.15
AFLATOXINS	Aflatoxins	LESS THAN 5 PPB	

No notes.
For additional information, please contact:
1) Customer Service at (314) 982-1310 -- for assay methodology
2) Dr. Dorrance Haught at (314) 768-4362 -- for nutritional interpretation
3) Richmond, IN Manufacturing Plant at (765) 962-9561 -- all other questions

The term "Less Than" is used to signify the lower limit of quantitation of the procedure under the conditions employed. The use of the term "Less Than" does not imply that traces of analyte were present.

LAB ID# 39-401

BENCHMARK ANALYTICS
4777 SAUCON CREEK ROAD
CENTER VALLEY, PA 18034-9004

PHONE (610) 974-8100
FAX (610) 974-8104

SEND DATA TO:

NAME:	Terry Kusznir	INV #:	335841-335843
COMPANY:	Huntingdon Life Sciences		
ADDRESS:	PO Box 2360, Mettlers Road East Millstone, NJ 08875-2360	PAGE:	1 OF 6
		PO #:	
PHONE:	(732) 873-2550 x 2100		
FAX:	(732) 873-3992	PWS ID#:	

TEST REPORT

PROJECT NAME:	ANIMAL DRINKING WATER	GRAB SAMPLES:	335841-335843
SAMPLED BY:	KINGA PALL	COMPOSITE SAMPLES:	NONE
LOCATION:	SEE BELOW	DATE RECEIVED BY LAB:	07/14/04
DATE:	07/13/04	TIME RECEIVED BY LAB:	0900
TIME:	SEE BELOW	RECEIVED FOR LAB BY:	J. ALTEMOSE

SAMPLE: SITE #1, V-2 ROOM 908 TIME: 1503

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
COPPER	0.06	MG/L	SM#18 3111 B	335841	07/15/04	0730	07/19/04	GR
LEAD	<0.001	MG/L	EPA 200.9	335841	07/15/04	0730	07/15/04	KW

SAMPLE: SITE #2, V-3 ROOM 956 TIME: 1512

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
COPPER	0.03	MG/L	SM#18 3111 B	335842	07/15/04	0730	07/19/04	GR
LEAD	<0.001	MG/L	EPA 200.9	335842	07/15/04	0730	07/15/04	KW

SAMPLE: SITE #3, V-1 ROOM 722 TIME: 1520

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
COPPER	<0.020	MG/L	SM#18 3111 B	335843	07/15/04	0730	07/19/04	GR
LEAD	<0.001	MG/L	EPA 200.9	335843	07/15/04	0730	07/15/04	KW

REMARKS:

REVIEWED

THE ABOVE TEST RESULTS MEET ALL THE REQUIREMENTS OF NELAC.

MANAGER: Stephanie Ahlen DATE: July 27, 2004

BENCHMARK ANALYTICS
4777 SAUCON CREEK ROAD
CENTER VALLEY, PA 18034-9004

PHONE (610) 974-8100
FAX (610) 974-8104

SEND DATA TO:

NAME: Terry Kusznir
COMPANY: Huntingdon Life Sciences
ADDRESS: PO Box 2360, Mettlers Road
East Millstone, NJ 08875-2360

PHONE: (732) 873-2550 x 2100
FAX: (732) 873-3992

INV #: 335844-335846
PAGE: 2 OF 6
PO #:
PWS ID#:

TEST REPORT

PROJECT NAME: ANIMAL DRINKING WATER
SAMPLED BY: KINGA PALL
LOCATION: SEE BELOW
DATE: 07/13/04
TIME: SEE BELOW

GRAB SAMPLES: 335844-335846
COMPOSITE SAMPLES: NONE
DATE RECEIVED BY LAB: 07/14/04
TIME RECEIVED BY LAB: 0900
RECEIVED FOR LAB BY: J. ALTEMOSE

SAMPLE: SITE #4, F WING ROOM 550 TIME: 1527

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
COPPER	0.04	MG/L	SM#18 3111 B	335844	07/15/04	0730	07/19/04	GR
LEAD	<0.001	MG/L	EPA 200.9	335844	07/15/04	0730	07/15/04	KW

SAMPLE: SITE #5, L WING ROOM 455 TIME: 1534

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
COPPER	0.04	MG/L	SM#18 3111 B	335845	07/15/04	0730	07/19/04	GR
LEAD	<0.001	MG/L	EPA 200.9	335845	07/15/04	0730	07/15/04	KW

SAMPLE: SITE #6, INHALATION ROOM 809 TIME: 1603

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
COPPER	<0.020	MG/L	SM#18 3111 B	335846	07/15/04	0730	07/19/04	GR
LEAD	<0.001	MG/L	EPA 200.9	335846	07/15/04	0730	07/15/04	KW

REMARKS:

REVIEWED
by Anya

THE ABOVE TEST RESULTS MEET ALL THE REQUIREMENTS OF NELAC.

MANAGER: Stephanie Oleksa DATE: July 27, 2004

BENCHMARK ANALYTICS
4777 SAUCON CREEK ROAD
CENTER VALLEY, PA 18034-9004

PHONE (610) 974-8100
FAX (610) 974-8104

SEND DATA TO:

NAME:	Terry Kusznir	INV #:	335848-335849
COMPANY:	Huntingdon Life Sciences		335855-335856
ADDRESS:	PO Box 2360, Mettlers Road		335862-335863
	East Millstone, NJ 08875-2360	PAGE:	3 OF 6
		PO #:	
PHONE:	(732) 873-2550 x2100		
FAX:	(732) 873-3992 **TEST REPORT**	PWS ID#:	

PROJECT NAME:	ANIMAL DRINKING WATER	GRAB SAMPLES:	335848-335849
SAMPLED BY:	KINGA PALL		335855-335856
LOCATION:	SEE BELOW		335862-335863
DATE:	07/13/04	COMPOSITE SAMPLES:	NONE
TIME:	SEE BELOW	DATE RECEIVED BY LAB:	07/14/04
		TIME RECEIVED BY LAB:	0900
		RECEIVED FOR LAB BY:	J. ALTEMOSE

SAMPLE: SITE #1, V-2 ROOM 908 TIME: 1503

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
PSEUDOMONAS	<1	PER 100 ML	SM#19 9215 B	335848	07/14/04	1425	07/15/04	JLS
ST)ARD PLATE COUNT SPC T+A 7/20	4	CFU/ML	SM#19 9215 B	335855	07/14/04	1220	07/16/04	JLS
TOTAL COLIFORM	0	PER 100 ML	EPA 600-R-00-013	335862	07/14/04	1300	07/15/04	KBF
E. COLI	0	PER 100 ML	EPA 600-R-00-013	335862	07/14/04	1300	07/15/04	KBF

SAMPLE: SITE #2, V-3 ROOM 956 TIME: 1512

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
PSEUDOMONAS	<1	PER 100 ML	SM#19 9215 B	335849	07/14/04	1425	07/15/04	JLS
STANDARD PLATE COUNT	3	CFU/ML	SM#19 9215 B	335856	07/14/04	1220	07/16/04	JLS
TOTAL COLIFORM	0	PER 100 ML	EPA 600-R-00-013	335863	07/14/04	1300	07/15/04	KBF
E. COLI	0	PER 100 ML	EPA 600-R-00-013	335863	07/14/04	1300	07/15/04	KBF

REMARKS:

REVIEWED T+A 7/20/04

THE ABOVE TEST RESULTS MEET ALL THE REQUIREMENTS OF NELAC.

MANAGER: Stephanie Olsen DATE: July 27, 2004

BENCHMARK ANALYTICS
4777 SAUCON CREEK ROAD
CENTER VALLEY, PA 18034-9004

PHONE (610) 974-8100
FAX (610) 974-8104

SEND DATA TO:
NAME: Terry Kusznir
COMPANY: Huntingdon Life Sciences
ADDRESS: PO Box 2360, Mettlers Road
East Millstone, NJ 08875-2360

PHONE: (732) 873-2550 x2100
FAX: (732) 873-3992

INV #: 335850-335851
335857-335858
335864-335865
PAGE: 4 OF 6

PO #:

PWS ID#:

TEST REPORT

PROJECT NAME: ANIMAL DRINKING WATER
SAMPLED BY: KINGA PALL
LOCATION: SEE BELOW
DATE: 07/13/04
TIME: SEE BELOW

GRAB SAMPLES: 335850-335851
335857-335858
335864-335865
COMPOSITE SAMPLES: NONE
DATE RECEIVED BY LAB: 07/14/04
TIME RECEIVED BY LAB: 0900
RECEIVED FOR LAB BY: J. ALTEMOSE

SAMPLE: SITE #3, V-1 ROOM 722 TIME: 1520

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
PSEUDOMONAS	<1	PER 100 ML	SM#19 9215 B	335850	07/14/04	1425	07/15/04	JLS
STANDARD PLATE COUNT SPC	2	CFU/ML	SM#19 9215 B	335857	07/14/04	1220	07/16/04	JLS
TOTAL COLIFORM	0	PER 100 ML	EPA 600-R-00-013	335864	07/14/04	1300	07/15/04	KBF
E. COLI	0	PER 100 ML	EPA 600-R-00-013	335864	07/14/04	1300	07/15/04	KBF

SAMPLE: SITE #4, F-WING ROOM 550 TIME: 1527

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
PSEUDOMONAS	<1	PER 100 ML	SM#19 9215 B	335851	07/14/04	1425	07/15/04	JLS
STANDARD PLATE COUNT	2	CFU/ML	SM#19 9215 B	335858	07/14/04	1220	07/16/04	JLS
TOTAL COLIFORM	0	PER 100 ML	EPA 600-R-00-013	335865	07/14/04	1300	07/15/04	KBF
E. COLI	0	PER 100 ML	EPA 600-R-00-013	335865	07/14/04	1300	07/15/04	KBF

REMARKS:

REVIEWED

THE ABOVE TEST RESULTS MEET ALL THE REQUIREMENTS OF NELAC.

MANAGER: Stephanie Olexa DATE: July 27, 2004

BENCHMARK ANALYTICS
4777 SAUCON CREEK ROAD
CENTER VALLEY, PA 18034-9004

PHONE (610) 974-8100
FAX (610) 974-8104

SEND DATA TO:
NAME: Terry Kusznir
COMPANY: Huntingdon Life Sciences
ADDRESS: PO Box 2360, Mettlers Road
East Millstone, NJ 08875-2360

PHONE: (732) 873-2550 x2100
FAX: (732) 873-3992

INV #: 335852-335853
335859-335860
335866-335867
PAGE: 5 OF 6
PO #:
PWS ID#:

TEST REPORT

PROJECT NAME: ANIMAL DRINKING WATER
SAMPLED BY: KINGA PALL
LOCATION: SEE BELOW
DATE: 07/13/04
TIME: SEE BELOW

GRAB SAMPLES: 335852-335853
335859-335860
335866-335867
COMPOSITE SAMPLES: NONE
DATE RECEIVED BY LAB: 07/14/04
TIME RECEIVED BY LAB: 0900
RECEIVED FOR LAB BY: J. ALTEMOSE

SAMPLE: SITE #5, L-WING ROOM 455 TIME: 1534

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
PSEUDOMONAS	<1	PER 100 ML	SM#19 9215 B	335852	07/14/04	1425	07/15/04	JLS
ST)ARD PLATE COUNT SPC T 4Aug	>3,000	CFU/ML	SM#19 9215 B	335859	07/14/04	1220	07/16/04	JLS
TOTAL COLIFORM	0	PER 100 ML	EPA 600-R-00-013	335866	07/14/04	1300	07/15/04	KBF
E. COLI	0	PER 100 ML	EPA 600-R-00-013	335866	07/14/04	1300	07/15/04	KBF

SAMPLE: SITE #6, INHALATION ROOM 809 TIME: 1603

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
PSEUDOMONAS	<1	PER 100 ML	SM#19 9215 B	335853	07/14/04	1425	07/15/04	JLS
STANDARD PLATE COUNT	<1	CFU/ML	SM#19 9215 B	335860	07/14/04	1220	07/16/04	JLS
TOTAL COLIFORM	0	PER 100 ML	EPA 600-R-00-013	335867	07/14/04	1300	07/15/04	KBF
E. COLI	0	PER 100 ML	EPA 600-R-00-013	335867	07/14/04	1300	07/15/04	KBF

REMARKS:

REVIEWED T 4Aug

THE ABOVE TEST RESULTS MEET ALL THE REQUIREMENTS OF NELAC.

MANAGER: Stephanie Allen DATE: July 27, 2004

BENCHMARK ANALYTICS
4777 SAUCON CREEK ROAD
CENTER VALLEY, PA 18034-9004

PHONE (610) 974-8100
FAX (610) 974-8104

SEND DATA TO:		INV #:	335854
NAME:	Terry Kusznir		335861
COMPANY:	Huntingdon Life Sciences		335868
ADDRESS:	PO Box 2360, Mettlers Road	PAGE:	6 OF 6
	East Millstone, NJ 08875-2360		
		PO #:	
PHONE:	(732) 873-2550 x2100		
FAX:	(732) 873-3992 **TEST REPORT**	PWS ID#:	

PROJECT NAME:	ANIMAL DRINKING WATER	GRAB SAMPLES:	335854
SAMPLED BY:	KINGA PALL		335861
LOCATION:	SEE BELOW		335868
DATE:	07/13/04	COMPOSITE SAMPLES:	NONE
TIME:	SEE BELOW	DATE RECEIVED BY LAB:	07/14/04
		TIME RECEIVED BY LAB:	0900
		RECEIVED FOR LAB BY:	J. ALTEMOSE

SAMPLE: SITE #7, PHARMACY TIME: 1556

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
PSEUDOMONAS	<1	PER 100 ML	SM#19 9215 B	335854	07/14/04	1425	07/15/04	JLS
STANDARD PLATE COUNT SPC	16	CFU/ML	SM#19 9215 B	335861	07/14/04	1220	07/16/04	JLS
TOTAL COLIFORM	0	PER 100 ML	EPA 600-R-00-013	335868	07/14/04	1300	07/15/04	KBF
E. COLI	0	PER 100 ML	EPA 600-R-00-013	335868	07/14/04	1300	07/15/04	KBF

REMARKS:

REVIEWED

THE ABOVE TEST RESULTS MEET ALL THE REQUIREMENTS OF NELAC.

MANAGER: Stephanie Olexa DATE: July 27, 2004

LAB ID# 39-401

BENCHMARK ANALYTICS
4777 SAUCON CREEK ROAD
CENTER VALLEY, PA 18034-9004

PHONE (610) 974-8100
FAX (610) 974-8104

SEND DATA TO:
NAME: Terry Kusznir
COMPANY: Huntingdon Life Sciences
ADDRESS: PO Box 2360, Mettlers Road
East Millstone, NJ 08875-2360

PHONE: (732) 873-2550 x2100
FAX: (732) 873-3992

INV #: 340365
PAGE: 1 OF 1
PO #:
PWS ID#:

TEST REPORT

PROJECT NAME: ANIMAL DRINKING WATER
SAMPLED BY: KINGA PALL
LOCATION: SEE BELOW
DATE: 08/16/04
TIME: 1533

GRAB SAMPLES: 340365
COMPOSITE SAMPLES: NONE
DATE RECEIVED BY LAB: 08/17/04
TIME RECEIVED BY LAB: 0845
RECEIVED FOR LAB BY: K. BROWN

SAMPLE: SITE #1, L-WING ROOM 455

TEST	RESULT	UNITS	METHOD	INV #	START DATE	START TIME	END DATE	INIT.
STANDARD PLATE COUNT	9	CFU/ML	SM#19 9215 B	340365	08/17/04	1052	08/19/04	KBF

REMARKS:

REVIEWED
25 Sept

THE ABOVE TEST RESULTS MEET ALL THE REQUIREMENTS OF NELAC.

MANAGER: Stephanie Oliva DATE: Aug 25, 04

Elizabethtown Water Company
Physical & Chemical Analyses

Date May 6, 2004

General Source Raritan-Millstone Plant

Sample No. 1 Plant Delivered Water - 6:30 a.m. .5-6-04, MT

Sample No. 2

Sample No. 3

Sample No. 4

Sample No. 5

Sample No. 6

Sample No. 7

Sample No. 8

Parameter	MCL (mg/l)	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
Temperature ° F	-	60							
Turbidity (NTU)	0.3 NTU	0.10							
Color	10 *	1							
Threshold Odor 40 ° C	3 TON *	3/2cc							
Threshold Taste	3 TTN *	3							
Conductivity (micromhos / cm)	-	333							
Hardness, Total (as mg / l CaCO3)	250 mg / l *	96							
Alkalinity	-	44							
pH	6.5-8.5 *	7.1							
Chlorine, Free / Total (mg / l Cl)	-	<0.05/0.94							
Calcium (as mg / l CaCO3)	-	74							
Magnesium (as mg / l CaCO3)	-	22							
Iron, Total (mg / l Fe)	0.3 mg/ l *	<0.05							
Sulfates (mg / l SO4)	250 mg/ l *	42.5							
Chlorides (mg / l Cl)	250 mg/ l *	44.2							
Fluoride (mg / l F)	2 mg / l*	0.10							
Total Dissolved Solids (mg / l)	500 mg / l *	146							
Total Suspended Solids (mg / l)	-	<0.10							
Ammonia Nitrogen (mg / l N)	-	<0.05							
Nitrate Nitrogen (mg / l N)	10 mg / l	1.05							
Dissolved Oxygen (mg / l O2)	-	10.1							
BOD 5 (mg / l O2)	-								
Langelier Index	+/- 1.0	-1.41							
Surfactants (mg / l LAS)	0.5 mg / l *	-							
Hydrogen Sulfide (mg / l H2S as S)	-	0							
Nitrite Nitrogen (mg / l N)	1 mg / l	<.01							
Phosphate (mg / l PO3)	-	0.09							
Manganese (mg / l MN)	0.05 mg / l *	<0.05							
Zinc	5 mg/l *	0.05							
T.O.C. (mg / l)	5 mg/l *	1.6							

Laboratory Analyst: JP

REVIEWED

* Secondary or Recommended MCL

Any questions please call Water Quality Specialist- (908) 301-3163

Elizabethtown Water Company
Physical & Chemical Analyses

Date June 2, 2004

General Source Raritan-Millstone Plant
Sample No. 1 Plant Delivered Water - 7:30 a.m. 6-2-04, ken
Sample No. 2
Sample No. 3
Sample No. 4
Sample No. 5
Sample No. 6
Sample No. 7
Sample No. 8

Parameter	MCL (mg/l)	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
Temperature ° F	-	68							
Turbidity (NTU)	0.3 NTU	0.08							
Color	10 *	1							
Threshold Odor 40 ° C	3 TON *	3.2/2cc							
Threshold Taste (1)	3 TTN *	3.1							
Conductivity (micromhos / cm)	-	367							
Hardness, Total (as mg / l CaCO3)	250 mg / l *	102							
Alkalinity	-	45							
pH	6.5-8.5 *	7.0							
Chlorine, Free / Total (mg / l Cl)	-	<0.05/1.10							
Calcium (as mg / l CaCO3)	-	74							
Magnesium (as mg / l CaCO3)	-	28							
Iron, Total (mg / l Fe)	0.3 mg/l *	<0.05							
Sulfates (mg / l SO4)	250 mg/l *	49.7							
Chlorides (mg / l Cl)	250 mg/l *	44.3							
Fluoride (mg / l F)	2 mg / l*	<0.1							
Total Dissolved Solids (mg / l)	500 mg / l *	174							
Total Suspended Solids (mg / l)	-	<0.10							
Ammonia Nitrogen (mg / l N)	-	0.1							
Nitrate Nitrogen (mg / l N)	10 mg / l	1.15							
Dissolved Oxygen (mg / l O2)	-	9.8							
BOD 5 (mg / l O2)	-								
Langelier Index	+/- 1.0	-1.40							
Surfactants (mg / l LAS)	0.5 mg / l *	-							
Hydrogen Sulfide (mg / l H2S as S)	-	0							
Nitrite Nitrogen (mg / l N)	1 mg / l	<.01							
Phosphate (mg / l PO3)	-	0.2							
Manganese (mg / l MN)	0.05 mg / l *	<0.05							
Zinc	5 mg/l *	0.46							
T.O.C. (mg / l)	5 mg/l *	1.3							

Laboratory Analyst: MT/JP

* Secondary or Recommended MCL

Any questions please call Water Quality Specialist- (908) 301-3163

(1) Taste and odor not regulated by Elizabethtown
pr 21 Jun 04

REVIEWED
pr 21 Jun 04

Elizabethtown Water Company
Physical & Chemical Analyses

Date July 7, 2004

General Source Raritan-Millstone Plant
Sample No. 1 Plant Delivered Water - 7:30 a.m. 7-7-04, Ken
Sample No. 2
Sample No. 3
Sample No. 4
Sample No. 5
Sample No. 6
Sample No. 7
Sample No. 8

Parameter	MCL (mg/l)	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
Temperature ° F	-	78.0							
Turbidity (NTU)	0.3 NTU	0.1							
Color	10 *	1.0							
Threshold Odor 40 ° C	3 TON *	2.9/2cc							
Threshold Taste	3 TTN *	2.9							
Conductivity (micromhos / cm)	-	379.0							
Hardness, Total (as mg / l CaCO3)	250 mg / l *	110.0							
Alkalinity	-	49.0							
pH	6.5-8.5 *	7.0							
Chlorine, Free / Total (mg / l Cl)	-	<0.05/0.90							
Calcium (as mg / l CaCO3)	-	74.0							
Magnesium (as mg / l CaCO3)	-	36.0							
Iron, Total (mg / l Fe)	0.3 mg/ l *	<0.05							
Sulfates (mg / l SO4)	250 mg/ l *	50.5							
Chlorides (mg / l Cl)	250 mg/ l *	40.1							
Fluoride (mg / l F)	2 mg / l*	<0.1							
Total Dissolved Solids (mg / l)	500 mg / l *	194.0							
Total Suspended Solids (mg / l)	-	<0.10							
Ammonia Nitrogen (mg / l N)	-	<0.05							
Nitrate Nitrogen (mg / l N)	10 mg / l	0.7							
Dissolved Oxygen (mg / l O2)	-	8.0							
BOD 5 (mg / l O2)	-								
Langelier Index	+/- 1.0	-1.2							
Surfactants (mg / l LAS)	0.5 mg / l *	-							
Hydrogen Sulfide (mg / l H2S as S)	-	0.0							
Nitrite Nitrogen (mg / l N)	1 mg / l	<.01							
Phosphate (mg / l PO3)	-	<0.05							
Manganese (mg / l MN)	0.05 mg / l *	<0.05							
Zinc	5 mg/l *	0.6							
T.O.C. (mg / l)	5 mg/l *	1.7							

Laboratory Analyst: MT

* Secondary or Recommended MCL
Any questions please call Water Quality Specialist- (908) 301-3163

REVIEWED
23 July

NAMSA
Ensuring Medical Device Safety and Compliance™

Corp. Hdqtrs: 2261 Tracy Road, Northwood, OH 43619-1397 / 419.666.9455 / Fax 419.666.2954
3400 Cobb International Blvd., Kennesaw, GA 30152-7601 / 770.427.3101 / Fax 770.426.5692
9 Morgan, Irvine, CA 92618-2078 / 949.951.3110 / Fax 949.951.3280
Affiliates: France • Germany • Israel • Taiwan • United Kingdom

Confidential
MS005_00P

Ted Weaver
The Andersons
P.O. Box 119
Maumee, OH 43537

Lab No. 04T_38507_01
P.O. No. TED WEAVER
Test Facility: NAMSA
6750 Wales Road
Northwood, OH 43619

STERILITY TEST

Test Article:	"425URB" - Bed O' Cobs Lot #DD084
ID No.	Lot DD084
Procedure/Test Method:	S-20431-01-00/Immersion
Test Article Received:	June 8, 2004
Test Start Date:	June 8, 2004
Test Termination Date:	June 22, 2004
Number of Products Tested:	1

STERILITY TEST RESULTS
Test Article Identity Maintained as Submitted by Client

Articles Tested	Number of Articles Tested	Type of Media	Incubation Temperature (Degrees C)	Number of Days Incubated	Number of Positive Articles
Product Section	1	SCDB-400 ml	20-25	14	0
Product Section	1	FTM-400 ml	30-35	14	0

SCDB = Soybean Casein Digest Broth FTM = Fluid Thioglycollate Medium

Results and conclusions apply only to the test article tested. No further evaluation of these results is made by NAMSA. Any extrapolation of these data to other samples is the responsibility of the sponsor. All procedures were conducted in conformance with good laboratory practice and ISO 17025.

Record Storage: All raw data pertaining to this study and a copy of the final report are to be retained in designated NAMSA archive files for a period of 5 years.

A-12-03-4246

cal Date Completed 6-23-04 Approved By

Michelle R. Pierce
Manager, Microbiology

Sterigenics * 305 Enterprise Drive * Westerville, Ohio 43081 * USA *
614-888-4077 * FAX 614-888-4223 * www.sterigenics.com

Certificate of Processing

Facility: Westerville
Customer Name: The Anderson Inc.
Customer PO #:
Run Date: 04/23/04
Run Number: AND01 AND 6040009
Total Pallets: 22

Cell: Production A

Date Format: MM/DD/YY
Customer Ref:

MATERIALS PROCESSED:

Qty	Product	Description	Lot Number	LOT #
1,713	BED'O COB 1/4" BAG	10/TOTE 23.75 X 11.75 X 8"	DD084	425RB
1	SAMPLE-506		DD084	425RB
1,714 Bags		Total		

Minimum Dose: 28.9 kGy
Maximum Dose: 53.9 kGy

Sterigenics certifies that the materials listed above (as described by its Manufacturer) received the indicated doses within the precision and accuracy of the dosimetry system employed:

Certified By: _____

Date: 04/26/04

ISO 9001:2000 REGISTERED

Original

A-12 03-4246

PROTOCOL

PETROLEUM COKE

REPRODUCTION/DEVELOPMENTAL TOXICITY SCREENING STUDY IN RATS VIA NOSE-ONLY INHALATION EXPOSURES

CONFIDENTIAL

HLS Study No.:	**03-4246**
Protocol No.:	**Final**
Date:	**4 May 2004**

PROTOCOL PREFACE

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

Study Title: Petroleum Coke: Reproduction/Developmental Toxicity Screening Study in Rats via Nose-Only Inhalation Exposures

HLS Study No.: 03-4246

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

[redacted]

11 May 04
Date

Huntingdon Life Sciences (HLS)
Address: 100 Mettlers Road
East Millstone, NJ 08875-2360
Phone No.: 732-873-2550 x2920
Fax No.: 732-873-3992

[redacted]

11 May 2004
Date

American Petroleum Institute (API)
Address: 1220 L Street, Northwest
Washington, D.C. 20005-4070
Phone No.: 202-682-8480
Fax No.: 202-682-8270

[redacted]

TABLE OF CONTENTS

1. INTRODUCTION

HLS Study No.	03-4246
Title	Petroleum Coke: Reproduction/Developmental Toxicity Screening Study in Rats via Nose-Only Inhalation Exposures
Testing Facility	Huntingdon Life Sciences 100 Mettlers Road East Millstone, NJ 08875-2360
Purpose	This study is designed to assess possible effects on reproductive performance, in male and female rats when the test substance is administered by nose-only inhalation exposure. The study should permit detection of effects on gonadal function, mating behavior, conception, development of the conceptus, parturition and pup survival to postnatal day 4. However, it will not provide complete information on all aspects of reproduction and development and will not allow for definite claims of no reproductive/developmental effects.

2. STUDY PERSONNEL

Study Director	[redacted]
Alternate Contact	[redacted]

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

3. PROPOSED STUDY DATES

Study Initiation Date	Date Study Director Signs Protocol
Receipt of Test Animals	11 May 2004 (Experimental Start)*
Initiation of Exposures	25 May 2004 (Experimental Start)**
Initiation of Mating	8 June 2004
Termination of Mating	22 June 2004
Termination of Exposures	Male Rats: 21 June 2004 Female Rats: 10 July 2004
Necropsy:	Male Rats: 25 June 2004 Female Rats: 3-17 July 2004
Submission of Draft Final Report:	18 October 2004
Experimental Termination:	Date of last data collection
Study Completion Date:	Date final report is signed by Study Director

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

4. EXPERIMENTAL DESIGN

Group	Group Designation	Exposure Levels (mg/m^3)	Treatment Schedule Pre-mating Period		Number of Animals	
			Male Rats[b]	Female Rats[c]	Male Rats	Female Rats
1	Air Control[a]	0	2 weeks	2 weeks	12	12
2	Low	25	2 weeks	2 weeks	12	12
3	Mid	75	2 weeks	2 weeks	12	12
4	High	200	2 weeks	2 weeks	12	12

[a] Control animals will be exposed to air only with the same treatment regimen as the test substance exposed groups.

[b] Male rats (12/group) will be exposed once daily (6 hours/day), seven days/week for 2 weeks prior to mating initiation. Exposure of male rats will continue during the mating and post-mating periods until euthanized on the day after a minimum exposure of 28 days.

[c] Female rats (12/group) will be exposed once daily (6 hours/day), seven days/week for at least two weeks prior to mating initiation. Female rats will continue to be treated once daily (6 hours/day) during the mating period, but will be separated from their male partners during exposure. Once mated, female rats will be treated once daily (6 hours/day) during gestation (Days 0-19). Sacrifice will be on lactation day 4 = post-natal day 4. Female rats without evidence of mating will continue to be treated for up to 19 days (6 hours/day) following completion of the mating period and then held for up to an additional 7 days prior to sacrifice. In the event that female rats without evidence of mating appear pregnant (based on observations and body weights), exposure will be terminated on the estimated Gestation Day 19 with sacrifice 7 days later.

The first day of exposures will be defined as Day 0 of the study. The day of detection of mating will be designated GD 0. The day of birth of the litter will be designated LD 0 = PND 0.

4.1. JUSTIFICATION FOR ROUTE, DURATION AND FREQUENCY

The inhalation route is one of the potential routes of human exposure to this test substance. The duration of the study and frequency of exposures are as recommended in the referenced guidelines. Daily exposure for 6 hours per day provides an adequate model for potential human exposure during a typical work-day, while continuous (7 days per week) exposure is necessary to maximize the likelihood of detecting effects within a relatively short exposure period and is essential for proper evaluation of effects on the process of development. The combination of a pre-mating exposure period of 2 weeks with an overall exposure period of at least 4

weeks, with mating/fertility assessments in both sexes and detailed histopathology of the male gonads, is considered sufficient for detection of most effects on fertility and gametogenesis. The 2-week pre-mating exposure period, continuing for females through gestation, also allows for evaluation of possible effects on the estrous cycle, implantation and development of the conceptus, on subsequent parturition and early offspring viability and growth.

4.2. JUSTIFICATION FOR TEST SYSTEM SELECTION

The rat is a rodent animal model acceptable under OECD and EPA testing guidelines for reproductive toxicity studies. In addition, an historical database for this strain of rat is available in the Testing Facility for comparative evaluation.

4.3. JUSTIFICATION FOR NUMBER OF ANIMALS

The number of animals in this study is considered the minimum necessary to allow for meaningful interpretation of the data, as required by OECD and EPA guidelines. Eight-10 pregnancies per group is considered an adequate number for screening for reproductive and developmental toxicities. The group size of 12 males and 12 females used in this study, retaining a one male to one female pairing ratio, with expected pregnancy rates of 80-90%, is anticipated to provide at least 8-10 pregnancies per group for evaluation.

4.4. JUSTIFICATION FOR EXPOSURE LEVEL SELECTION

The exposure levels are based on results of a 2-week range-finding study 03-6147 which showed slight to moderate pulmonary toxicity (but not systemic toxicity) at exposure levels of 25, 75 and 200 mg/m^3. Therefore, the same exposure levels were accepted as appropriate for this study.

5. TEST SUBSTANCE

5.1. TEST SUBSTANCE:

Petroleum Coke

The test substance is labeled as "3.3 Micron Mean Petroleum Coke" based on preparation by AVEKA, 2045 Wooddale Drive, Woodbury, MN 55125 and their particle size evaluation using the Horiba LA-910 with the test substance suspended in water.

TEST SUBSTANCE CATEGORY:

Residual product from petroleum refining

5.2. IDENTIFICATION OF TEST SUBSTANCE

Unless otherwise noted, the identity, strength, purity, composition, stability, and method of synthesis, fabrication and/or derivation of each batch of the test substance will be documented by the Sponsor. This documentation will be maintained by the Sponsor. The test substance will be stored (ambient conditions) in the inhalation laboratory and handled routinely while wearing gloves, dust-mask and labcoat.

At the end of the study, a 200 gram sample of the test substance will be shipped for analysis to ChevronTexaco Energy Research and Technology Corp., 100 Chevron Way, Richmond, CA 94802, 510-242-7037, attn: Patrick Beatty.

5.3. ARCHIVAL SAMPLES

An archival sample from each lot of test substance will be taken and shipped to the Archives of the Sponsor (EPL Archives, Inc., 45610 Terminal Drive, Sterling, VA, 703-435-8780 ext 201, attn: Sam Busey). Since multiple studies are conducted with the same test substance, a common archival sample will be taken and appropriately labeled.

5.4. UNUSED TEST SUBSTANCE

The unused portion of test substance as well as any empty test substance containers will be returned to the Archives of the Sponsor (see Section 5.3 above) following completion of the study.

6. TEST ANIMALS

6.1. SPECIES

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

6.2. SUPPLIER

Charles River Laboratories
Kingston, New York

Note: males and females will be supplied from separate colony rooms to ensure that there is no mating of male-female siblings.

6.3. ANIMAL REQUIREMENTS/SPECIFICATIONS

6.3.1. Number

Male Rats	FemaleRats	Total
48	48	96

6.3.2. Age and Weight

Animals will be ordered with body weight stipulations to allow all rats of the same sex to be within ± 20% of the mean weight at the time of randomization. Male rats will be approximately 6 weeks at receipt and approximately 8 weeks (200-300 grams) at initiation of treatment. Female rats will be approximately 6 weeks at receipt and approximately 8 weeks (150-250 grams) at initiation of treatment. Female rats will be nulliparous and non-pregnant. Animals outside this weight range will be used at the discretion of the Study Director.

6.4. ANIMAL HUSBANDRY

6.4.1. Facilities Management/Animal Husbandry

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

6.4.2. Veterinary Care

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

6.4.3. Housing

All animals will be housed individually in stainless steel suspended cages with wire mesh floors and fronts except for the mating period when one male and one female rat will be housed together. Cages will be arranged in such a way that possible effects due to placement are minimized. During cohabitation (when female rats will be brought to the male rats' cages), male and female rats will then be housed in stainless steel cages of appropriate size for group housing animals. Each cage will be fitted to secure a glass feeder jar with a stainless steel lid. Clean feeder jars and fresh feed will be provided at least weekly. From Day 18 of gestation and during

lactation, the dam will be housed with her litter in plastic "shoebox" cages with bedding. Clean feed jars and fresh feed will be provided at least weekly for periods when feed consumption is not being recorded and at each interval when feed consumption will be recorded.

6.4.4. Feed and Feed Analysis

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

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

6.4.5. Water and Water Analysis

Facility water is supplied by Elizabethtown Water Company (Westfield, NJ) and will be provided *ad libitum* to individual animal cages via an automated watering system.

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

6.4.6. Bedding Article

Ground corncob bedding (Bed-O'-Cobs® 1/4 inch Irradiated, The Andersons, Maumee, Ohio) will be provided for each mated female rat on Gestation Day 18. Fresh bedding will be provided weekly or as needed throughout lactation. There are no known contaminants in the bedding which are expected to interfere with the results of this study.

6.4.7. Environmental Conditions

Light/Dark Cycle

Twelve hour light/dark cycle provided via automatic timer.

Temperature

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

Humidity

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

6.5. ACCLIMATION PERIOD

Approximately 2 weeks; all animals will be checked for viability twice daily. Prior to assignment to study, all animals will be examined to ascertain their suitability.

6.6. ANIMAL ASSIGNMENT

More animals than required for the study will be purchased and acclimated. Animals considered suitable for study on the basis of pretest physical examinations, body weight data and any other pretest evaluations, will be randomly assigned to control or treated groups in an attempt to equalize mean group body weights. Disposition of all animals not utilized in the study will be maintained in the study file.

6.7. ANIMAL IDENTIFICATION

Each animal will be assigned a temporary identification number upon receipt. After selection for study, each animal will be tail-tattooed with a number assigned by the Testing Facility. This number plus the study number will comprise the unique animal number for each animal. Each cage will be provided with a cage card which will be color coded for exposure level identification and will contain the study number and animal number.

6.8. MATING PROCEDURE

Within each treatment group, the male and female rats will be co-housed (1:1 in the male's cage) until evidence of mating is seen or for 14 consecutive days. Female rats will be observed at approximately the same time each morning for the presence of a vaginal plug or sperm in the vaginal smear. If not mated, the stage of the estrous cycle will instead be recorded. The day on which evidence of mating is observed will be defined as day 0 of gestation. Once mated, the female rat will be removed from the mating cage and housed individually for the remainder of the

study. After the mating period is over, female rats without evidence of copulation will be removed from the mating cage and housed individually for the remainder of the study (up to 26 days) and monitored for visible signs of pregnancy with corresponding body weight gain.

6.9. ANIMAL HUSBANDRY DURING EXPOSURE

Housing - individually in tubes
Feed – none
Water – none

7. TEST SUBSTANCE ADMINISTRATION

7.1. ROUTE OF ADMINISTRATION

Inhalation via nose-only exposure.

7.2. DURATION AND FREQUENCY OF ADMINISTRATION

Male rats will be exposed once daily, seven days/week for 2 weeks prior to mating initiation. Exposure of male rats will continue during the mating and post-mating periods until euthanized on the day after a minimum exposure of 28 days. Female rats (12/group) will be exposed once daily, seven days/week for at least two weeks prior to mating initiation. Female rats will continue to be treated once daily during the mating period, but will be separated from the males during actual exposure. Once mated, female rats will be treated once daily during gestation (days 0-19). Female rats without evidence of mating will continue to be treated for up to 19 days (6 hours/day) following completion of the mating period and then held for up to an additional 7 days. In the event that female rats without evidence of mating appear pregnant (based on observations and body weights), exposure will be terminated on the estimated Gestation Day 19.

7.3. ADMINISTRATION OF TEST SUBSTANCE

The test substance will be administered as a **dust** in the breathing air of the animals by nose-only inhalation exposure. The test atmosphere will be generated by an appropriate procedure (Wright Dust Feeder with or without cyclone pre-collectors) determined during pre-study trials. The trials will be performed (at least two 6-hour periods) to select the optimal set of conditions to generate a stable and uniform atmosphere at the target exposure levels with a mass median aerodynamic diameter of 1.0 - 3.0 microns. The method will be described in the raw data of the study and in the report.

The nose-only exposure chambers will each have a volume of approximately 40 liters. Each chamber will be operated at a minimum flow rate of 8 liters per minute. The final airflow will be set to provide at least one air change in 5.0 minutes (12 air changes/hour) and a T_{99} equilibrium time of at most 23 minutes. This chamber size and air-flow rate is considered adequate to maintain the oxygen level at least 19%. At the end of the exposure, all animals will remain in the chamber for a minimum of the T_{99} equilibrium time. During this time the chamber will be operated at approximately the same flow rate using clean air only.

7.4. EXPOSURE CONCENTRATION ADMINISTRATION

A nominal exposure concentration will be calculated daily. The flow of air through the chambers will be monitored using appropriate calibrated equipment. The test substance consumed during the exposure will be divided by the total volume of air having passed through the chamber (volumetric flow rate times total exposure time) to give the nominal concentration.

During each exposure, measurements of airborne concentrations of test substance will be performed at least 4 times using an appropriate sampling procedure (drawing from the exposure chamber a measured volume of air through a pre-weighed glass fiber filter) and gravimetric analytical procedure (post-weighing the glass fiber filter and dividing the weight gain by the measured volume of sampled air). If more than the normal amount of trials is required because of test substance generation or monitoring problems (50 technician hours), the Sponsor will be consulted prior to additional trials (additional cost).

7.5. PARTICLE SIZE DISTRIBUTION ANALYSIS

During each week of exposure, particle size determinations will be performed using a TSI APS (for Group 1) and a cascade impactor (for Groups 2-4) to characterize the aerodynamic particle size distribution of the aerosolized test substance.

7.6. CHAMBER ENVIRONMENT

Temperature, humidity and airflow rate will be recorded every 30 minutes during exposure. Chamber temperature and relative humidity will be maintained, to the extent possible, at 20 to 24°C and 40 to 60%, respectively.

7.7. SUMMARY OF CHAMBER ACTIVITY

The minimum frequency of chamber activity is summarized below:

Activity	Frequency/Chamber
Measured Test Substance Concentration	4X/day
Particle Size	1X/week
Temperature	13X/day
Relative Humidity	13X/day
Airflow Rate	13X/day
Nominal Test Substance Concentration (excluding the air control chamber)	1X/day
Rotation Pattern of Exposure Tubes	1X/day
Loading/Unloading Verification	1X/day

8. EXPERIMENTAL EVALUATION

8.1. OBSERVATIONS

8.1.1. Viability Checks (Cageside)

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

8.1.2. Detailed Physical Observations

All animals will be observed as a group at least once during each exposure. This will routinely be performed near the middle of each exposure and may be performed more frequently if signs of toxicity are noted.

Each animal will be removed from its cage and a detailed physical observation performed prior to randomization. Male rats will have a detailed physical observation performed once weekly beginning during the premating period and continuing through euthanasia. Female rats will have a detailed physical observation performed weekly during the premating period and on Gestation Days 0, 7, 14, 21 and Lactation Days 0, 1 and 4. Female rats without evidence of mating will continue to be observed weekly during the mating and post-mating period until euthanized.

Examinations during non-exposure periods will include observations of general condition, skin and fur, eyes, nose, oral cavity, abdomen and external genitalia, occurrence of secretions and excretions, and autonomic activity (e.g., lacrimation, piloerection, pupil size, unusual respiratory pattern). Changes in gait, posture and response to handling as well as the presence of

clonic or tonic movements, stereotypy (e.g., excessive grooming, repetitive circling) or bizarre behavior (e.g., self-mutilation, walking backward) will be recorded. Pertinent behavioral changes, signs of difficult or prolonged parturition and all signs of toxicity, including mortality, will be recorded. These records will include, as appropriate, time of onset, degree and duration.

8.2. BODY WEIGHTS

Body weights of the male rats and the female rats will be recorded at the time of randomization into test groups, on the day treatment is initiated and at least weekly thereafter throughout the study until euthanized. Mated female rats will be weighed on Gestation Days 0, 7, 14 and 20 and female rats that deliver litters will be weighed on Lactation Days 1 and 4. Female rats without evidence of mating will continue to be weighed weekly during the mating and post-mating period until euthanized. A terminal body weight will also be recorded for each animal.

8.3. FEED CONSUMPTION

Feed consumption for the male rats and the female rats will be measured pretest and weekly during the pre-mating treatment period. Feed consumption will not be measured during the mating period when male rats are being co-housed with female rats. Feed consumption for the male rats will be measured weekly, and if not mated, for the female rats, during the post-mating period. For pregnant or confirmed mated female rats, feed consumption will be measured on Gestation Days 0-7, 7-14 and 14-20 and on Lactation Days 1-4.

8.4. PARTURITION AND LACTATION

On Gestation Day 18, several days prior to expected parturition, female rats will be transferred to solid, plastic cages with bedding article provided. Thereafter, examination for signs of parturition will be made twice daily (morning and afternoon). The duration of gestation will be calculated. Evidence of difficult or prolonged parturition will be recorded. The day on which parturition initiates will be defined as Lactation Day 0. Litters will be observed as soon as possible after parturition completion for the number of live and dead pups, runts and pup abnormalities. Each pup will be sexed. Thereafter, litters will be observed twice daily (morning and afternoon). All pups in the litter will be uniquely identified by toe tattoo after parturition completion. The presence of dead pups will be recorded, and these will be removed from the litter as found and necropsied. Unusual observations and the absence of milk in the stomach will be noted. Any abnormalities observed in maternal behaviour (particularly relating to maternal care of the litter) will be recorded.

8.5. F_1 PUP EVALUATIONS

8.5.1. Pup Physical Examinations

Each pup will be given a gross physical examination on Lactation Days 0 and 4. Pups will also be observed for any abnormal behavior.

8.5.2. Body Weights and Sexing Data

Individual pup body weights data will be recorded on Lactation Days 1 and 4. Pups will be sexed on Lactation Day 0 and sex verified on Lactation Day 4.

9. POSTMORTEM

9.1. METHOD OF EUTHANASIA

All animals (except Lactation Day 4 pups) will be euthanized by exsanguination following an overexposure of inhaled carbon dioxide. Lactation Day 4 pups will be euthanized using an intraperitoneal injection of sodium pentobarbital.

9.2. POSTMORTEM EXAMINATION – ADULT ANIMALS DYING DURING THE STUDY

Animals that die during the study will be given a macroscopic postmortem examination and gross lesions will be saved and preserved in 10% neutral buffered formalin. Reproductive tissues as indicated below will also be saved but no organ weights will be recorded. Female rats dying during the study will have the number of any implantation sites and corpora lutea recorded.

9.3. EUTHANASIA SCHEDULE

9.3.1. Adult Male Rats

Male rats will be euthanized after at least 28 days of exposure. Necropsy schedules will be established in order to assure that approximately equal numbers from each group will be examined at similar times of each day of necropsy.

9.3.2. Adult Female Rats

Mated female rats will be euthanized on Lactation Day 4. Female rats in which evidence of mating was detected but failed to deliver will be sacrificed 26 days after evidence of mating.

Female rats where no evidence of mating was detected and who failed to deliver a litter will be euthanized 26 days after the completion of the mating period. Female rats with total litter loss (all pups found dead prior to scheduled sacrifice) will be euthanized on Lactation Day 4.

9.4. MACROSCOPIC EXAMINATION – ADULT MALE RATS

Macroscopic postmortem examinations will be performed on all male rats, including those dying spontaneously or euthanized in a moribund condition. Postmortem examinations will include examination of external surface, all orifices, cranial cavity, nasal cavity (external examination), neck and its associated tissues and organs, thoracic, abdominal and pelvic cavities and their associated tissues and organs, and external surfaces of the brain. Special attention will be paid to the organs of the reproductive system. Gross lesions will be preserved in 10% neutral buffered formalin with the exception of testes and epididymides which will be preserved in a modified Davidson's fixative for at least 24 hours and then stored in 10% neutral buffered formalin. If lesions are saved, corresponding tissues from several control animals may be saved for comparative purposes.

9.5. MACROSCOPIC EXAMINATIONS – ADULT FEMALE RATS

Macroscopic postmortem examinations will be performed on all female rats, including those dying spontaneously or euthanized in a moribund condition. Postmortem examinations will include examination of external surface, all orifices, cranial cavity, nasal cavity (external examination), neck and its associated tissues and organs, thoracic, abdominal and pelvic cavities and their associated tissues and organs, and external surfaces of the brain. Special attention will be paid to the organs of the reproductive system. The number of implantation sites and corpora lutea will be recorded for each female rat. Gross lesions will be preserved in 10% neutral buffered formalin. If lesions are saved, corresponding tissues from several control animals may be saved for comparative purposes.

9.6. ORGAN WEIGHTS - ADULT RATS

Organs indicated below will be collected at the scheduled necropsy, weighed wet, recorded and organ/body weight ratios and organ/brain weight ratios calculated. Organs will not be weighed for animals found dead or euthanized in a moribund condition and for those female rats not delivering pups. Prior to weighing, all organs will be carefully dissected and properly trimmed to remove fat and other contiguous tissue in a uniform manner. Organs will be weighed as soon as possible after dissection to avoid drying. Paired reproductive organs will be weighed separately.

Male Rats	Female Rats	All Rats
Epididymides	Ovaries with Oviducts	Adrenal Glands
Prostate	Uterus with Vagina	Brain
Seminal Vesicles with Coagulating Gland		Lungs
		Pituitary
Testes		Thymus

9.7. TISSUES PRESERVED - ADULT RATS

Tissues listed in Appendix A will be obtained at necropsy for all male and all female rats from each exposure group and preserved in 10% neutral buffered formalin with the exception of testes and epididymides which will be preserved in a modified Davidson's fixative for at least 24 hours and then stored in 10% neutral buffered formalin. Lungs (gravity method) will be infused with 10% neutral buffered formalin for optimal preservation.

9.8. MICROSCOPIC PATHOLOGY EVALUATIONS - ADULT RATS

Microscopic examinations for control and high exposure group male and female animals will be performed on tissues and organs as designated in Appendix A. During the microscopic examination of the testes, special emphasis will be placed on the stages of spermatogenesis and the interstitial testicular cell structure. Histopathological examination of the ovary will detect qualitative depletion of the primordial follicle population. Any abnormalities not noted during macroscopic postmortem examinations that are seen during histological processing will be recorded. If treatment-related changes are observed in the high exposure group, microscopic examinations will be performed on the low and mid exposure groups upon approval of the Sponsor (additional cost).

Stains: Standard stains (hematoxylin and eosin) will be used. Special stains may be employed on selected tissues to aid in making a diagnosis at the discretion of the Study Pathologist. Special stains may also be employed at the request of the Sponsor (additional cost).

9.9. MACROSCOPIC POSTMORTEM EXAMINATION - F_1 PUPS

Macroscopic postmortem examinations (internal and external) will be performed on all F_1 pups found dead during lactation. Unusual observations, including gross abnormalities and the absence of milk in the stomach, will be noted and then the carcasses will be discarded. F_1 pups found dead at birth will be identified (lung floatation test) as stillborn or alive but found dead. Macroscopic postmortem examinations (external only) will be performed on all F_1 pups on Lactation Day 4 for pups surviving

to that interval. Unusual observations, including gross abnormalities, will be noted and then the carcasses will be discarded.

10. PRESERVATION OF RECORDS AND SPECIMENS

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

The Sponsor will be contacted in order to determine the final disposition of these materials. The Sponsor is responsible for all cost associated with the storage of these materials beyond 1 year from the issuance of the final report and for any costs associated with the shipment of these materials to the Sponsor or to any other facility designated by the Sponsor.

11. STATISTICAL EVALUATIONS

11.1. CONTINUOUS DATA - to include but not be limited to:

- Body weights
- Body weight changes
- Feed consumption values
- Gestation length
- Number of implantation sites and corpora lutea
- Pre- and post-implantation loss
- F_1 pup weights (each weighing interval during lactation)
- Number of pups per litter
- Number of male and female pups
- Pup weight distinguished by sex and as a composite for both sexes (litter as experimental unit)
- Absolute organ weights, organ weight to body weight ratios and organ weight to brain weight ratios

Evaluation of equality of group means will be made by the appropriate statistical method. For all parameters except for organ weights, the standard one-way analysis of variance (ANOVA) using the F ratio to assess significance will be used (Dunlap and Duffy, 1975). If significant differences among the means are indicated, additional testing will be performed using Dunnet's t-test to determine which means are significantly different from the control (Dunlap et al., 1981). Organ weight data will be analyzed only by parametric methods. Bartlett's test (Bartlett, 1937; Sokal and Rohlf, 1995; Snedecor and Cochran, 1967) will be performed to determine if groups have equal variances. The standard

one-way analysis of variance (ANOVA) using the F ratio to assess significance will be used (Dunlap and Duffy, 1975). If significant differences among the means are indicated, additional tests will be used to determine which means are significantly different from the control: Dunnett's t-test (Dunlap et al., 1981; Dunnett, 1955, 1964) for homogeneous data, or Cochran and Cox's modified t-test (Cochran and Cox, 1959) for non-homogeneous data. Bartlett's test for equality of variance will be conducted at the 1% significance level; all other statistical tests will be conducted at the 5% and 1% significance levels.

References for these procedures are:

Bartlett, M.S. 1937. Properties of sufficiency and statistical tests. *Proceedings of the Royal Society, Series A,* 160: 268-282; Cochran, W.G. and Cox, G.M. 1959. *Experimental Designs*, New York: John Wiley, pp. 100-102; Dunlap, W.P. and Duffy, J.A. 1975. Fortran IV Functions for Calculating Exact Probabilities Associated with Z, Chi-Square, T and F Values. *Behav. Res. Methods and Instrumentations* 7:59-60; Dunlap, W.P., Marx, M.S. and Agamy, G.G. 1981. Fortran IV functions for calculating probabilities associated with Dunnett's test. *Behav. Res. Methods and Instrumentation* 13: 363-366; Dunnett, C.W. 1955. A multiple comparison procedure for comparing several treatments with a control. *Journal of the American Statistical Association* 50: 1096-1121; Dunnett, C.W. 1964. New tables for multiple comparisons with a control. *Biometrics* 20-3: 482-491; Snedecor, G.W. and Cochran, W.G. 1967. *Statistical Methods.* 6th edition. Ames: Iowa State University Press; Sokal, R.R. and Rohlf, F.J. 1995. Biometry. 3rd Edition. San Francisco: W.H. Freeman pp. 369-371; Steel, R.G.D. 1959. A multiple comparison rank sum test: treatment versus control. *Biometrics* 15: 560-572.

11.2. INCIDENCE DATA - to include but not be limited to:

- Mortality rate
- Mating indices, male and female fertility indices
- Litter survival indices
- Gestation indices
- Incidence of dams with no viable pups
- Mean pup survival indices (Days 0 and 4)

A Fisher Exact Test with Bonferonni correction (Seigel, S. 1956. Nonparametric Statistics for the Behavioral Sciences. New York: McGraw-Hill.) will be performed to identify differences between the control and treatment groups. All statistical tests will be conducted at the 5% and 1%, two-sided risk levels.

12. REPORTING

12.1. STATUS REPORTS

The Testing Facility will furnish progress reports to the Sponsor at least weekly.

12.2. FINAL REPORT

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

12.2.1. Body of Report

- Compliance Statement (including Sponsor signature line)
- Quality Assurance Statement
- Abstract
- Introduction
- Experimental Design (including justification for exposure levels)
- Materials and Methods
- Results and Discussion
- Conclusion (including NOAEL statement, if applicable)
- Statistical Procedures
- Protocol deviations and study impact statements

12.2.2. Summary Tables

- Exposures
- Mortality
- Mating indices and male and female fertility indices
- Physical in-life observations
- Mean body weight data - male and female rats premating; male rats during mating and postmating; female rats during gestation and lactation
- Mean animal weight gain data - male and female rats premating; male rats during mating and postmating; female rats during gestation and lactation
- Mean feed consumption data - male and female rats premating; female rats during gestation and lactation

- Mean gestation length
- Mean number of implantation sites and corpora lutea
- Mean pre- and post-implantation loss
- Mean female rat litter data to include the number of pups (live, dead and total) at birth and number of live pups on Lactation Days 0 and 4
- Litter survival indices
- Mean litter pup survival indices (Lactation Days 0 and 4)
- Mean pup weights (Lactation Days 1 and 4)
- Mean pup sex ratio (Days 0 and 4)
- Macroscopic postmortem examination (male rats, female rats, F_1 pups)
- Mean absolute organ weights, organ weight to body weight ratios and organ weight to brain weight ratios
- Microscopic Pathology

12.2.3. Appendix Tables (Individual data)

- Mortality
- Physical in-life observations
- Individual body weight data - male and female rats premating; male rats during mating and postmating; female rats during gestation and lactation
- Individual animal weight gain data - male and female rats premating; male rats during mating and postmating; female rats during gestation and lactation
- Individual feed consumption data - male and female rats premating; female rats during gestation and lactation
- Individual mating and pre-coital interval data
- Individual gestation length
- Individual number of implantation sites and corpora lutea
- Individual pre- and post-implantation loss
- Individual female rat litter data to include the number of pups (live, dead and total) at birth and number of live pups on Lactation Days 0 and 4
- Individual litter survival indices
- Individual litter pup survival indices (Days 0 and 4)
- Individual pup weights (Days 1 and 4)
- Individual macroscopic postmortem examination (male rats, female rats, F_1 pups)
- Individual absolute organ weights, organ weight to body weight ratios and organ weight to brain weight ratios
- Individual Microscopic Pathology

12.2.4. Appendices

- Analyses of feed, water and bedding
- Personnel involved in the study
- Protocol and Amendments

12.3. ROBUST SUMMARY

This report will be separately provided by the Testing Facility's UK office in both IUCLID and WORD® electronic formats.

13. REGULATORY REFERENCES

13.1. TEST GUIDELINE

This study will comply with the

1. Organization for Economic Cooperation and Development (March 22, 1996) OECD Guidelines for Testing of Chemicals; OECD Guideline 421: Reproduction/Developmental Toxicity Screening Test, pp. 1-10.

2. EPA Health Effects Test Guidelines (July 2000) OPPTS 870.3550: Reproduction/Developmental Toxicity Screening Test, pp. 1-11.

13.2. GOOD LABORATORY PRACTICES

This study will be conducted in compliance with

1. Organization for Economic Cooperation and Development (OECD) Good Laboratory Practices as set forth in ENV/MC/CHEM(98)17.

2. EPA Good Laboratory Practices as set forth in 40 CFR Part 792 (TSCA).

13.3. ANIMAL WELFARE ACT COMPLIANCE

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

1. The Sponsor's signature on this protocol documents for the study described, that there are no generally accepted non-animal alternatives and the study does not unnecessarily duplicate previous experiments.

2. All procedures used in this study have been designed to avoid discomfort, distress and pain to the animals. All methods are described in this study protocol or in written laboratory standard operating procedures.

3. Any procedures outlined in this study protocol which are expected to cause more than momentary or slight pain or distress to the animals will be performed with appropriate sedatives, analgesics or anesthetics unless the withholding of these agents is justified for scientific reasons, in writing, by the Sponsor and the Study Director and approved by the IACUC; in which case the procedure will continue for the minimum time necessary. Documentation of the justification for withholding treatment for pain or distress and IACUC approval of the procedures will be made prior to study initiation on the IACUC Protocol Review form.

4. Animals experiencing more than momentary or slight pain or distress due to test substance or emergency situations such as injury or illness will be treated by the Testing Facility's veterinarian staff with approved analgesics or agents to relieve pain. If possible, the Study Director will be consulted prior to treatment; however, the veterinary staff is authorized to administer emergency treatment as necessary. Any subsequent treatment or euthanasia will be administered after consultation with the Study Director. The Sponsor will be advised by the Study Director of all emergency situations in as timely a manner as possible.

5. Methods of euthanasia used during this study are in conformance with the above referenced regulations.

13.4. INSTITUTIONAL ANIMAL CARE AND USE COMMITTEE (IACUC)

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

14. QUALITY ASSURANCE MONITORING

The Quality Assurance Unit of Huntingdon Life Sciences (East Millstone, NJ) will monitor the facilities, equipment, personnel, methods, practices, records, raw data, draft and final reports and controls used in this study to assure that they are in conformance with this protocol, company Standard Operating Procedures and the referenced Good Laboratory Practice regulations.

15. ALTERATION OF DESIGN

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

APPENDIX A
TISSUES PRESERVED/EXAMINED

Tissue	Tissues Preserved	Microscopic[a] Examination
Adrenal glands	X	
Brain	X	
Epididymides	X	X
Larynx[b]	X	X
Lungs (with mainstem bronchi)	X	X
Lymph nodes (mediastinal)	X	
Nasopharynx[c]	X	X
Ovary with oviducts	X	X
Pituitary	X	
Prostate	X	X
Seminal Vesicles	X	X
Testes	X	X
Thymus	X	
Trachea	X	X
Uterus with Vagina	X	X
Macroscopic Lesions	X	X

[a]Control and high exposure male and female animals. If a treatment-related change is observed in the high exposure group, microscopic examinations will be performed on the low and mid exposure groups upon Sponsor approval (additional cost).

[b]The laryngeal mucosa shall be examined. Sections of the larynx to be examined include the epithelium covering the base of the epiglottis, the ventral pouch and the medial surfaces of the vocal processes of the arytenoid cartilages.

[c]Four sections of the nasopharyngeal tissue shall be examined. This shall include sections through the nasal cavity and examinations of the squamous, transitional, respiratory and olfactory epithelia.

Protocol Amendment No. 1

Study Title: Petroleum Coke: Reproduction/Developmental Toxicity Screening Study in Rats via Nose-Only Inhalation Exposures

Changes

1. Proposed Study Dates, page 2:

Revise: Termination of Exposures Male Rats: **24** ~~21~~ June 2004
Female Rats: 10 July 2004

2. Experimental Design, page 3:

Add to revise: **The exposure levels for Groups 2, 3 and 4 will be 30, 100 and 300 mg/m^3, respectively.**

3. Justification for Exposure Level Section, page 4:

Replace:
The exposure levels are based primarily upon findings in a two-week range-finding study (03-6147) in which exposure to the test substance resulted in alveolar and/or bronchiolar epithelial hyperplasia/hypertrophy at exposure levels of 25, 75 and 200 mg/m^3. Both the severity (slight to moderate) and the incidence (0 to 100%) were exposure level-responsive. Absolute lung weight was increased by approximately 12 to 16% at the highest concentration. The highest exposure concentration chosen for this reproduction screen, 300 mg/m^3, was selected as a balance between the above pulmonary effects, the longer exposure period of this study and greater respiratory demands of pregnancy.

4. Detailed Physical Observations, page 11:

Revise:.....Female rats will have a detailed physical observation performed weekly during the premating period and on Gestation Days 0, 7, 14, **20** ~~21~~ and Lactation Days 0, 1 and 4.....

5. Macroscopic Postmortem Examination - F_1 Pups, page 15:

Replace: **Macroscopic post-mortem examinations (internal and external) will be performed on all F_1 pups found dead during lactation. Unusual observations, including gross abnormalities and the absence of milk in the stomach, will be noted and then the carcasses will be discarded. The day of death of any pup found dead will be recorded. Intact F_1 pups found dead on the day of birth will be identified by the lung floatation test, examination of the lungs or ductus arteriosus, or other appropriate method as stillborn or alive at birth. F_1 pups found dead on the day of birth that are autolyzed, partially cannibalized or otherwise unsuitable for this determination will be so noted and reported. Macroscopic post-mortem examinations (external only) will be performed on all F_1 pups on Lactation Day 4 for pups surviving**

Protocol Amendment No. 1

to that interval. Unusual observations, including gross abnormalities, will be noted and then the carcasses will be discarded.

Reasons for Changes

1. Correction of scheduled date since animals will be exposed until day before sacrifice.
2. A re-examination of the data from the range-find study 03-6147 resulted in a decision that the animals could tolerate a higher exposure level than 200 mg/m^3 since only slight to moderate pulmonary toxicity was seen.
3. See #2.
4. Correction of the observation intervals during the gestation period.
5. Clarification of the procedures for examining dead pups.

Additional Cost Required: Yes

Amendment approved by:

[redacted]

21 May 04
Date

21 May 04
Date

20 May 2004
Date

Protocol Amendment No. 2

Study Title: Petroleum Coke: Reproduction/Developmental Toxicity Screening Study in Rats via Nose-Only Inhalation Exposures

Changes

1. Proposed Study Dates, page 2:

Revise: Termination of Exposures	Female Rats: **11** July 2004
Terminal Sacrifice	Female Rats: **5-16** July 2004

2. Detailed Physical Observations, page 11:

Add: ...Female rats will have a detailed physical observation performed weekly during the premating period and on Gestation Days 0, 7, 14, 20 and Lactation Days 0 **(except if parturition doesn't complete on the same day as it initiates)**, 1 and 4...

3. Final Report, Appendices, page 20:

Add: **Final report for the Range-Find study 03-6147.**

Reasons for Changes

1. Correction of scheduled dates.
2. Clarification of the lactation period observations intervals.
3. Request of the Sponsor.

Additional Cost Required: No
Amendment approved by:

[redacted]

27 Dec 04
Date

12/23/04
Date

Protocol Amendment No. 3

Study Title: Petroleum Coke: Reproduction/Developmental Toxicity Screening Study in Rats via Nose-Only Inhalation Exposures

Changes

Microscopic Pathology Evaluations-Adult Rats, page 15 and Appendix A, page 22:
Add: **The respiratory tract (nasopharynx, larynx, trachea and lungs) will also be examined for the Groups 2 and 3 test animals.**

Reasons for Changes

Effects of exposure (including proliferative and/or inflammatory responses in the lungs) were noted in the Group 4 high exposure test animals compared to the Group 1 air control test animals. Therefore, an evaluation of the lower level exposed test animals is considered of interest.

Additional Cost Required: Yes

Amendment approved by:

[redacted]

27 Dec 04
Date

12/23/04
Date

Protocol Amendment No. 4

Study Title: Petroleum Coke: Reproduction/Developmental Toxicity Screening Study in Rats via Nose-Only Inhalation Exposures

Changes

Microscopic Pathology Evaluations-Adult Rats, page 15 and Appendix A, page 22:
Add: **The mediastinal lymph nodes will also be examined for all test animals.**

Reasons for Changes

Effects of exposure (marked to severe increase in lymphoid cellularity caused by an expansion of the paracortical/T-lymphocyte population) were noted in the Group 4 high exposure test animals compared to known normal morphology of this node. Therefore, an evaluation of the control and all exposed test animals is considered of interest.

Additional Cost Required: Yes

Amendment approved by:

[redacted]

4/13/05
Date

4/13/05
Date

Protocol Amendment No. 5

Study Title: Petroleum Coke: Reproduction/Developmental Toxicity Screening Study in Rats via Nose-Only Inhalation Exposures

Changes

Identification of Test Substance, page 5:
Revise: At the end of the study, a 200 gram sample of the test substance will be shipped for analysis to ChevronTexaco Energy Research and Technology Corp., 100 Chevron Way, Richmond, CA 94802, 510-242-7037, attn: Patrick Beatty. **Since this analysis was not conducted using the same methods as the pre-study analysis and therefore was not valid for a comparison to the pre-study data, the data from an analysis of a sample from the same lot number stored at Wildlife International will instead be reported for this study.**

Reasons for Changes

Clarification of the data to be reported for test substance stability analysis.

Additional Cost Required: No

Amendment approved by:

[redacted]

4/16/2008
Date

4/16/2008
Date

	Testing Facility Personnel	Appendix BB

TITLE/DEPARTMENT	NAME/DEGREE
SENIOR VICE PRESIDENT, SAFETY ASSESSMENT	[redacted]
DIRECTOR, DEVELOPMENTAL AND REPRODUCTIVE TOXICOLOGY	
DIRECTOR, ANALYTICAL SERVICES	
DIRECTOR, TOXICOLOGY OPERATIONS	
DIRECTOR, QUALITY ASSURANCE	
STUDY DIRECTOR	
PATHOLOGIST	
STUDY MONITOR	
VETERINARIAN	
MANAGER/SUPERVISOR	
Rodent and Reproductive Toxicology	
Inhalation Toxicology	
Pharmacy	
Necropsy and Fetal Pathology	
Histology	

	Historical Control Data CD Rat - Mating, Fertility and Gestation Preface	Appendix CC

Data used for historical control purposes was obtained from inhalation studies run prior to this study (from April 2001 to August 2002).

	Historical Control Data CD Rat - Mating, Fertility and Gestation	Appendix CC

Study ID	Initiation Date	Females						
		Paired w/ Males No.	Mated No.	Mating Index %	Pregnant No.	Fertility Index %	No. with Liveborn No.	Gestation Index %
00-4208 P0	12-Jun-01	26	24	92.3	23	95.8	23	100.0
00-4208 F1		26	23	88.5	21	91.3	21	100.0
00-4207 P0	30-Apr-01	26	25	96.2	24	96.0	24	100.0
00-4207 F1		26	25	96.2	25	100.0	25	100.0
00-4206	20-Aug-02	26	24	92.3	21	87.5	21	100.0
00-4205	20-May-02	26	25	96.2	22	88.0	22	100.0
00-4204	19-Mar-02	26	26	100.0	25	96.2	25	100.0
00-4203	21-Jan-02	26	26	100.0	25	96.2	25	100.0
00-4202	22-Aug-01	26	26	100.0	24	92.3	24	100.0
	MEAN		**25**	**95.7**	**23**	**93.7**	**23**	**100.0**
	SD		**1.1**	**4.05**	**1.7**	**4.19**	**1.7**	**-**
	N		**9**	**9**	**9**	**9**	**9**	**9**
	MIN		**23**	**88.5**	**21**	**87.5**	**21**	**100.0**
	MAX		**26**	**100.0**	**25**	**100.0**	**25**	**100.0**

	Report Amendments	Appendix DD

There are no amendments for this report at this time.