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In May, 1987, submitted a TSCA Section 8(e) notification on the toxicity of clarified slurry oil (CAS 64741-62-4) and the relationship between subchronic and developmental toxicity and chemical composition. Supplemental submissions to this 8(e) have been made for several other refinery streams, further describing the relationship between stream composition and toxicity. An interim (preliminary) report for a subchronic dermal toxicity study on Heavy Coker Gas Oil (HCGO) was submitted on April 23, 1992. We are now submitting the final report for this study.

As stated in the interim report, rats treated dermally with 125 mg/kg/day HCGO showed changes in several hematologic parameters including decreased RBC and platelet counts and increased WBC. Certain clinical chemistry parameters and organ weights for liver and thymus were also affected. The final report also describes histopathologic changes in bone marrow and thymus, which are consistent with clinical chemistry and organ weight data. The NOAEL for systemic toxicity was 30 mg/kg/day. We believe the effects seen in this study are due largely to polycyclic aromatic compounds in agreement with conclusions reported in our previous submissions.

<u>Study #</u>	<u>CAS #</u>	<u>Test Article</u>
64184	64741-81-7	Heavy Coker Gas Oil

This study was carried out at

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Confidentiality is being claimed for company identifiers and names of company employees. All pages containing this information have been stamped "Confidential". Two copies of this notification are being submitted; the confidential information has been circled in one copy and excised from the other. The latter copy is intended for the EPA's public files. The substantiation for this claim is attached.

Sincerely,

Enclosures

This report is made in compliance with Section 8(e) of the Toxic Substances Control Act (15 U.S.C. 2607), pursuant to our understanding of the statement of Interpretation and Enforcement Policy (43 Fed. Reg. 1110 et seq.). It has been compiled based on information available within the time period given. While we believe the tests reported were properly performed, no representation can be made as to their accuracy of content. The corporation and individual signatory also reserve the right to supplement any or all of the data contained herein and to revise or amend any conclusion drawn therefrom.



**SUMMARY**

Heavy Coker Gas Oil (HCGO-T) was applied to the clipped backs of groups of 10 male and 10 female Sprague-Dawley rats five days per week for thirteen weeks at dose levels of 0, 8, 30, and 125 mg/kg/day. Based on the following results, the No-Observed-Adverse-Effect-Level (NOAEL) for HCGO-T is 30 mg/kg/day.

Animals exhibited a few clinical signs indicative of systemic toxicity. Moderate to severe skin irritation was exhibited in each of the groups exposed to HCGO-T. Body weight gain was affected only in male rats exposed to 125 mg/kg/day. Serum chemistry parameters which were adversely affected by exposure to HCGO-T for thirteen weeks at a dose level of 125 mg/kg/day included: male rats - urea nitrogen; female rats - urea nitrogen, potassium, and sorbitol dehydrogenase. Hematology parameters were also adversely affected by exposure to HCGO-T for thirteen weeks at a dose level of 125 mg/kg/day: male rats - red blood cell count, hemoglobin, hematocrit, and platelet count; female rats - hemoglobin, platelet count, white blood cell count, segmented neutrophils and lymphocytes. Urinalysis evaluations showed no treatment-related effects. In male rats administered HCGO-T at a dose level of 125 mg/kg/day, a significant increase in relative liver weight and a significant decrease in absolute thymus weight were observed. Female rats exposed to this same dose level demonstrated a significant increase in relative and absolute liver weights and a significant decrease in absolute and relative thymus weights. At necropsy, macroscopic findings which appeared to be treatment-related included increased liver size, decreased thymus size, large lymph nodes and evidence of skin irritation. Microscopic alterations were observed in the skin of animals exposed to HCGO-T. Reduced numbers of thymocytes were observed in the thymus for animals dosed at 125 mg/kg/day. Granulocytes in bone marrow were increased in Group 4 rats. Significant increase in liver weights was noted in Group 4 rats, however, no microscopic alterations were revealed. No other treatment-related effects were observed. No treatment-related effects were observed for the parameters examined to evaluate male reproductive health.

## 1.0 INTRODUCTION

Heavy Coker Gas Oil (CAS NO. 64741-81-7) is a petroleum refinery stream produced at refinery by thermal cracking of vacuum residuum. The production, transportation, and subsequent processing of this material can result in prolonged and repeated human skin contact. Selection of this refinery stream for toxicological evaluation was based primarily on its chemical composition. Data generated from this study are to be used in helping to define the chemical class components present in refinery streams that are responsible for specific toxic effects.

The primary objective of this study was to evaluate the potential systemic toxicity and skin irritation of Heavy Coker Gas Oil (HCGO-T) when administered dermally to rats five days per week for thirteen weeks at dose levels of 8, 30, and 125 mg/kg/day. The dose levels were chosen based on data obtained in a range-finding study [ #64183], study [ #50391] and the practical limits of the amount of material that can be applied to the backs of rats. This study was conducted in Sprague-Dawley rats because 1) of the large amount of relevant background literature on this strain, 2) this was the strain used in the range-finding study, 3) rats have been a good model for predicting toxicological effects in humans and 4) there are no generally accepted non-animal alternatives to accomplish the objectives of this study.

This study was initiated at

on September 4, 1990. Administration of the test material occurred between September 11 and December 13, 1990. Necropsies were completed on December 14, 1990. The experimental termination date was November 3, 1994.

## 2.0 MATERIAL AND METHODS

### 2.1 Experimental Design

A summary of the experimental design is presented in Table 1. All treatments were performed daily, five days per week, for thirteen weeks. HCGO-T (CRU #86272) was applied via dermal application. Methodologies and results evaluating humoral immune response (antibody levels and spleen cell response) of animals in Groups 5-8 are addressed separately in Interoffice Correspondences on said topics [7,8].

Table 1. Summary of Experimental Design

Group	Treatment	Dose (mg/kg/day)	Number of Animals		
			Initial	Lab. Studies*	Necropsy
1	Untreated Control	0	10M, 10F	10M, 10F	All
2	HCGO-T	8	10M, 10F	10M, 10F	All
3	HCGO-T	30	10M, 10F	10M, 10F	All
4	HCGO-T	125	10M, 10F	10M, 10F	All
5	Untreated Control	0	4F	4F**	
6	HCGO-T	8	4F	4F**	
7	HCGO-T	30	4F	4F**	
8	HCGO-T	125	4F	4F**	

\* Except Sperm Evaluation and Urinalysis

\*\* These groups were used for evaluation of serum antibody levels and spleen cell response.

## 2.2 Animal and Animal Husbandry Data

Seventy-five male and seventy-five female virus-free Sprague-Dawley rats (Rat/Tac:N (SD) fBR/Taconic, Germantown, New York) were received when they were twenty-nine days of age. They were acclimated to the testing facility for fourteen days prior to allocation into experimental groups at the initiation of the one-week pretreatment phase. Each animal was uniquely identified by a numbered metal ear tag after assignment to an experimental group. Animals were individually housed in suspended, stainless steel cages, 10" long x 7" high x 7" wide, with wire mesh bottoms and fronts. Absorbent material in the dropping pans was changed at least three times a week. Clean cages were supplied approximately every two weeks. Animals were housed in air-conditioned rooms which averaged 66-73° (low of 65°, high of 74°), 34-59% relative humidity (low of 25%, high of 72%), and 12-hour light-dark cycles. On several occasions the humidity and temperature fell outside of the desired range of 40-60% and 68-72° F, respectively. On three occasions the light cycle varied by approximately 1 hour. These deviations did not affect the results of this study. Purina Certified Lab Chow, #5002 in pelleted form, was fed *ad libitum*, except for periods of deprivation required for hematology/serum chemistry evaluations and necropsy. Tap water, also available *ad libitum*, was delivered by an Edstrom Automatic Watering System. The system was set to flush the room distribution lines daily at high pressure to minimize water stagnation and bacterial

growth. No contaminant was considered to be present in animal feed or water at a level sufficient to interfere with this study.

### 2.3 Material to be Administered

HCGO-T was supplied by CRU (Chemical Repository Unit).

Test material: Heavy Coker Gas Oil

Identification: CRU No. 86272

Stability: Sample expiration date is April 1, 1991

### 2.4 Test Material Administration/Control

Using Oster electric clippers with #40 blades, the hair was clipped (shaved) from the dorsal trunk of each animal approximately 24 hours before the start of dosing. Hair was reclipped as necessary, but at least once per week. Care was taken to avoid abrasion of the skin during removal of the hair. The animals were 49 days of age at the initiation of dosing. They were dosed each weekday for thirteen weeks by application of the test material to their shaved backs. Each animal in Groups 2, 3, 4, 6, 7, and 8 received an amount of HCGO-T that was calculated from its most recent body weight and the dose for that group. The test material was measured by volume in a syringe that allowed accuracy within 10% of the calculated volume. The exposure sites were not covered, but the animals wore cardboard "Elizabethan" collars to minimize ingestion of the test substance. Collars were fitted five days prior to the start of dosing so that the rats were used to them when the first dose was administered. During the week, if an animal was found to be without a collar, a new collar was applied prior to the next dosing. Each Saturday, the collars were removed and the backs of the rats were wiped off with gauze to remove as much residual test substance as possible. Wiping was performed to minimize oral ingestion. Collars were replaced on Monday morning prior to or at the time of test material application. The untreated control animals were handled in the same manner as the other test animals except that no material was applied to their skin. Treated animals were dosed through the day prior to their scheduled sacrifice.

### 2.5 Observation During the Study

#### 2.5.1 Clinical Observations and Skin Irritation

Each animal was observed once daily during the pretreatment and dosing phases for normal or abnormal clinical signs. The parameters observed included appearance, behavior, excretory

function, and discharges. The effects of the test material on the skin at the site of application were scored weekly. Erythema and edema were evaluated using the Draize scales. The skin was also examined and scored for chronic deterioration: flaking, thickening, stiffening, cracking, and sloughing. The scale used for scoring skin irritation is presented below. On days when scoring was not done, no comment was made on the condition of the skin.

#### Scale for Scoring Skin Irritation

##### **ERYTHEMA\***

- 0 = Normal
- 1 = Barely perceptible
- 2 = Well defined
- 3 = Moderate
- 4 = Severe (beet red) to slight eschar

##### **EDEMA\***

- 0 = Normal
- 1 = Barely perceptible
- 2 = Edges of area well defined
- 3 = Area raised by approximately 1 mm
- 4 = Area raised by more than 1 mm or edema extends beyond area of exposure

##### **CHRONIC DETERIORATION OF THE SKIN**

- 0 = Normal
- 1 = Desquamation (flaking of skin)
- 2 = Feels thickened and/or stiff; feels leathery
- 3 = Visibly thickened and/or stiffened; visibly leathery
- 4 = Cracks and fissures; almost no pliability
- 5 = Dermis is exposed (sloughing of crust; ulceration; open sores) or scar tissue is present

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\* Draize, J.H., Woodward, G. and Calvery, H.O. (1944).  
Methods for the study of irritation and toxicity of substances applied topically to the skin and mucous membranes. *J. Pharmacol Exp. Therap.*, 82: 377-390.

On weekdays, animals were checked for moribundity and mortality twice daily, at least six hours apart. On weekends and holidays, they were checked once, as soon as practical each day. On two occasions mortality checks were not performed according to this schedule.

#### **2.5.2 Body Weights**

All animals were weighed the day after receipt and approximately one week before the first dosing (the latter for allocation into experimental groups). Animals allocated into experimental groups were weighed immediately before the first dosing and approximately weekly thereafter. The body weight of each animal was measured to the nearest tenth of a gram and recorded to the nearest gram.

### 2.5.3 Hematology

During Weeks 5 and 13, blood samples were collected from all animals in Groups 1 through 4 in a two-day period, males the first day and females the second day. The afternoon before blood collections, food was removed from the cage of each rat scheduled. Toxicology technicians anesthetized the rats with diethyl ether and collected blood samples from the orbital sinus.

One Microtainer tube containing EDTA as an anticoagulant was filled with approximately 250 ul of whole blood from each animal. Hematology analyses were performed by the Biochemical Toxicology Section using an automated cell counter on unclotted samples on the same calendar day that they were collected. If a sample clotted, another sample was obtained. The samples were analyzed for:

hematocrit	red blood cell (RBC) count
hemoglobin	white blood cell (WBC) count
platelet count	

Mean corpuscular volume (MVC), mean corpuscular hemoglobin concentration (MCHC), and mean corpuscular hemoglobin (MCH) were calculated. During blood collection, a thin smear of fresh blood was made by a member of the Biochemical Toxicology Section for determination of RBC morphology and WBC differentials.

### 2.5.4 Serum Chemistry

Blood samples were collected as described in Section 2.5.3. At least 1 ml of whole blood from each rat was collected in two Microtainer tubes, allowed to clot for approximately thirty minutes, and centrifuged to obtain the serum. Samples were analyzed for the following biochemical parameters by a member of the Biochemical Toxicology Section using a Hitachi 704 analyzer:

glucose	sorbitol dehydrogenase
alanine aminotransferase	bilirubin, total
aspartate aminotransferase	total protein
albumin (A)	alkaline phosphatase
cholesterol	urea nitrogen
triglycerides	uric acid
creatinine	sodium
potassium	calcium
inorganic phosphorus	chloride

Globulin (G) and A/G ratio were calculated.

### 2.5.5 Urinalysis

During Weeks 5 and 13, freshly voided urine samples were collected and analyzed. Samples were obtained from the control and high-dose animals (Groups 1 and 4), unless otherwise noted. The samples were examined visually by members of the Subchronic Toxicology Section for appearance (i.e., color and clarity), and by Ames Multistix-SG using the Clinitek 10 urine chemistry analyzer for the following:

bilirubin ketone	blood pH	glucose protein	specific gravity urobilinogen
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### 2.5.6 Pathology

All animals in Groups 1 thru 4 surviving until the end of the study were sacrificed and necropsied. Each animal had the food removed from its cage the afternoon prior to its scheduled sacrifice. All necropsies were performed according to approved Standard Operating Procedures.

From all animals sacrificed as scheduled, the following organs (when present) were weighed to the nearest milligram:

adrenals kidneys liver	heart prostate spleen	ovaries thymus uterus	testes epididymides brain
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The following tissues (when present) from each animal were preserved in 10% neutral buffered formalin:

adrenals esophagus head (entire) *kidneys *liver (part of median and right lateral lobes) pituitary skeletal muscle spleen thymus tongue and larynx	bone with marrow (rib sternum, femur) heart and aorta lacrimal glands lungs and bronchi lymph nodes, cervical mammary gland (with skin) prostate and seminal vesicles stomach (glandular and squamous) uterus (cervix, corpus, and horns)	brain eyes and optic nerve intestine, large (cecum, colon and rectum) lymph nodes, mesenteric lymph nodes, draining ovaries and oviducts salivary glands (major) spinal cord (cervical, thoracic) thyroid and parathyroids trachea	epididymides Harderian glands intestine, small (duodenum, ileum, jejunum) gross lesions pancreas sciatic nerve skin, treated testes urinary bladder vagina
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\*From all animals, a sample of the right kidney and of the median lobe of the liver were fixed in a formaldehyde-glutaraldehyde mixture (4% and 1%, respectively, in an aqueous buffer).

As specified below, tissues were processed for microscopic examination from all animals in the control group (Group 1) and highest dose group (Group 4). In addition, the treated skin, sternum and thymus from Group 3 and treated skin from Group 2 were processed. Tissues were processed according to Standard Operating Procedures. Sections for examination were stained with hematoxylin and eosin, or any special stain deemed necessary. Microscopic examination was performed by \_\_\_\_\_, D.V.M, Ph.D. and prepared by \_\_\_\_\_

adrenals (both)	bone and marrow (sternum)	brain (3 sections)
epididymis (right only)	eye (left) and optic nerve	heart
intestine - large (colon)	intestine - small (duodenum)	kidneys (both)
liver (2 lobes)	lung (left lobe)	muscle - skeletal (thigh)
nerve- peripheral (sciatic)	ovaries (both)	pancreas (head)
skin - treated (2 sections)	salivary gland (submaxillary)	prostate and seminal vesicles
spleen	stomach (squamous and glandular)	testes (right only)
thymus (both lobes)	thyroid (both lobes)	urinary bladder
uterus (body and horns)	gross lesions	

#### 2.5.7 Spermatozoa/Sperm Evaluations

The left epididymis and testis from Group 1 (Untreated Control) and Group 4 (HCGG-T, 125 mg/kg/day) male rats were provided to a member of the Developmental Toxicology Group at the time of scheduled necropsy. Ten control animals and ten treated animals were examined. Prior to sample preparation of the testis for examination, the tunica albuginea and corresponding blood vessel were removed and discarded. The resulting testicular parenchyma, and the cauda epididymis, were individually weighed (nearest 0.001 gram) and the weight recorded. Testes were prepared for spermatid count and epididymides were prepared for spermatozoa count and morphology according to Standard Operating Procedures.

For sperm motion analyses, the left vas deferens was immediately excised from each male and the sperm contents were removed and placed into a Phosphate Buffered Saline/Bovine Serum Albumin solution and incubated. Following incubation, an aliquot of the prepared sample was placed on a siliconized slide and allowed to equilibrate. A minimum of eight fields per sample were videotaped and subsequently analyzed by the CellSoft Automated Semen Analyzer (CASA). Characteristics of sperm motion analyzed included percent motile sperm, curvilinear velocity, and linearity.

## 2.6 Data Handling and Storage

Body weights, clinical signs, dose calculations, evidence of dosing, serum chemistry data, hematology data, and pathology data (macroscopic findings) were recorded and maintained using the Grosse computer system specific for that discipline. Pathology data (microscopic findings) was recorded and maintained using the Pathdata computer system. Urinalysis results, mortality and animal husbandry data and sperm evaluations were recorded by hand. All raw data and original study documents (i.e., test request, protocol, protocol amendments, compound receipt and dispensing records, etc.) will be stored in the Document Archives. Wet tissue samples and sperm slides will be stored in the Specimen Archives. Quantitative data (body weight, serum chemistry, hematology, and organ weight data) were analyzed by parametric methods: analysis of variance (ANOVA) and associated F-test, followed by Dunnett's test (body weights) and Tukey's Multiple Comparison Test (serum chemistry, hematology and organ weight data), provided that there was statistical significance in ANOVA. Differences between control and treated groups were considered statistically significant only if the probability of the differences being due to chance was less than 5% ( $p < 0.05$ ). A description of the statistical analyses performed on sperm/spermatozoa evaluation data can be found in the report on said topic [Study #64184M] which is available in the Document Archives.

### 3.0 RESULTS

All data tables are located following the ANCILLARY INFORMATION section. Results of the immunotoxicity evaluations can be found in Interoffice Correspondences issued on said topic [7, 8].

#### 3.1 Clinical Observations and Skin Irritation

With the exception of one control female rat, no animals associated with this study died or were sacrificed prior to the scheduled necropsy. The cause of death for this animal was an over-exposure to diethyl ether while anesthetizing the animal for blood sample collection. A couple of high-dose animals exhibited signs indicative of systemic toxicity (e.g. cool to the touch, decreased food consumption, emaciated and appearing pale). Most clinical signs were local effects from the collars (e.g. neck irritation, chromodacryorrhea, reddish nasal discharge). A summary incidence of clinical observations are presented in Tables 2a (males) and 2b (females). Moderate to severe skin irritation was observed in the treated groups. Individual clinical observations can be found in Appendix 6.1. Individual skin irritation scores can be found in Appendix 6.2.

#### 3.2 Body Weights

Group mean body weights and group mean body weight changes are presented in Table 3 (a - males, b - females) and Table 4 (a - males, b - females), respectively. Body weight gain was significantly decreased in males exposed to HCGO-T at a dose level of 125 mg/kg/day. Individual body weights can be found in Appendix 6.3.

#### 3.3 Hematology

Summaries of hematology values are presented in Tables 5a (males) and 5b (females). After thirteen weeks of exposure, hematology parameters which were adversely affected by exposure to HCGO-T included: male rats - red blood cell count, hemoglobin, hematocrit, and platelet count; female rats - hemoglobin, platelet count, white blood cell count, segmented neutrophils and lymphocytes. These effects were noted only at a dose level of 125 mg/kg/day. A more detailed description of the results can be found in the report issued on said topic [3].

#### 3.4 Serum Chemistry

Summaries of serum chemistry values are presented in Tables 6a (males) and 6b (females). Serum chemistry parameters which were adversely affected by exposure to HCGO-T for thirteen weeks

included: male rats - urea nitrogen; female rats - urea nitrogen, potassium, and sorbitol dehydrogenase. Effects were noted at a dose level of 125 mg/kg/day. In male rats, creatinine levels were significantly increased at 30 mg/kg/day, but not at 125 mg/kg/day; in females, creatinine was also increased at 30 mg/kg/day but not at 125 mg/kg/day. A more detailed description of the results can be found in the report issued on said topic [4].

### 3.5 Urinalysis

No differences among the groups were evident for the parameters evaluated. Individual urinalysis data can be found in Appendix 6.4.

### 3.6 Pathology

A more detailed description of the following results can be found in the report issued on said topic [5].

#### 3.6.1 Organ Weights

Mean absolute organ and (fasted) body weights are presented in Table 7 (a-Males, b-Females) and mean relative organ weights are presented in Table 8 (a-Males, b-Females). A significant ( $p < 0.05$ ) increase in relative liver weights and a decrease in absolute thymus weights were observed in male rats dosed at 125 mg/kg/day. Female rats (HCGO-T; 125 mg/kg/day) demonstrated a significant increase in relative and absolute liver weights, as well as a significant decrease in relative and absolute thymus weights.

#### 3.6.2 Observations at Necropsy

At necropsy, macroscopic findings which appeared to be treatment-related included increased liver size, decreased thymus size, large lymph nodes and evidence of skin irritation. Macroscopic findings are presented in Table 9.

#### 3.6.3 Histopathology

The incidence of histopathologic observations for both male and female rats are summarized in Table 10. Microscopic changes were seen in the treated skin and consisted of thickened epidermis (nucleated cells), increased mitosis of basal cells, hyperkeratosis and subacute inflammation in the dermis. Atrophy of the sebaceous glands was seen in rats treated at 30 or 125 mg/kg/day.

Significant increase in liver weight was seen in Group 4 rats, however, no microscopic alterations were revealed. Thymocytes were reduced in animals treated at 125 mg/kg/day. Increased numbers of granulocytes in the marrow of Group 4 rats were observed. Group 5 rats, dosed at 30 mg/kg/day, did not show any detectable microscopic changes in the marrow, liver or thymus. No other treatment-related effects were observed.

### 3.7 Spermatozoa/Spermatid Evaluations

Epididymal spermatozoa morphology and count, testicular spermatid count, and sperm motion are summarized in Table 11. No treatment-related effects were observed for the parameters evaluated. A more detailed description of the results can be found in the report issued on said topic [6].

#### 4.0 CONCLUSIONS

Dermal application of Heavy Coker Gas Oil to rats for thirteen weeks produced skin irritation at all levels of administration. Based on the following results, the No-Observed-Adverse-Effect-Level (NOAEL) for systemic toxicity in rats exposed to Heavy Coker Gas Oil is 30 mg/kg/day.

A few signs indicative of systemic toxicity were observed. Moderate to severe skin irritation was observed in animals exposed to Heavy Coker Gas Oil. Body weight gain was significantly decreased in males exposed at a dose level of 125 mg/kg/day. A variety of serum chemistry and hematology parameters were adversely affected in both sexes at 125 mg/kg/day. Creatinine levels were significantly increased in rats dosed at 30 mg/kg/day, but not at 125 mg/kg/day. Parameters evaluated for urinalysis were not affected. Treatment-related effects were observed, microscopically, in treated skin for all animals exposed to HCGO-T. A significant decrease in thymus weights (males-absolute, females-relative and absolute) accompanied with a decrease in thymocytes were observed in the high-dose group. An increase in granulocytes in the marrow was observed in rats exposed to 125 mg/kg/day. A significant increase in liver weights (males-relative, females-relative and absolute) was seen in high-dose animals, however, no microscopic alterations were revealed. No treatment-related effects were observed for sperm evaluations.

## 5.0 ANCILLARY INFORMATION

### 5.1 Personnel Associated with the Study

Biophase

Ph.D.

Study Director  
Study Assistant

Hematology [3]

[3] See substudy report for personnel associated with study.

Serum Chemistry [4]

[4] See substudy report for personnel associated with study.

Pathology [5]

, D.V.M., Ph.D.

Study Pathologist

Sperm Morphology [6]

[6] See substudy report for personnel associated with study.

Immunotoxicity [7 & 8]

[7 & 8] See substudy report for personnel associated with study.

### 5.2 References\*

1. Study 50391: Thirteen Week Dermal Administration of Heavy Coker Gas Oil to Rats: Biophase Report;  
Study Director
2. Study 64183: Range-Finding Study: Dermal Administration of Coker Gas Oil to Rats;  
Study Director Heavy
3. Study 64184HA: Hematology Data for a 13-Week Dermal Study of Coker Gas Oil in the Sprague-Dawley Rat;  
Study Biochemist Heavy
4. Study 64184CA: Serum Chemistry Data for a 13-Week Dermal Toxicity Study of Heavy Coker Gas Oil in the Sprague-Dawley Rat;  
Study Biochemist
5. Study 64184P: Thirteen-Week Dermal Administration of Oil to Rats -Pathology Report;  
Study Pathologist Heavy Coker Gas