CONTAINS NO CBI

[redacted]

Halocarbon
PRODUCTS CORPORATION
887 KINDERKAMACK ROAD, RIVER EDGE, NEW JERSEY 07661
TELEPHONE: 201-262-8899 FAX: 201-262-0019
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FYI-0494-000952

FYI-94-000952
INIT 04/12/94

REC'D
OFFICE OF POLLUTION
PREVENTION AND TOXICS
94 APR 12 AM 8:54

April 7, 1994

CERTIFIED MAIL

ORIGINAL

Document Processing Center (TS-790)
Attn: Section 8(e) Coordinator
Office of Toxic Substances
U.S. Environmental Protection Agency
401 "M" Street, S.W.
Washington, D.C. 20460

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84940000052

SECTION 8(e) NOTICE

Re: Mixture of 2,3-dichloro-1,1,1,4,4,4-hexafluoro-2-butene (99.94%) (CAS 374-07-2) and 2-chloro-1,1,1,4,4,4-hexafluoro-2-butene (0.06%) CAS 400-44-2) [Report Name: QC-74]

Dear Sir/Madame:

The following notice is submitted to you in accordance with paragraph V, F in the Agreement between Halocarbon Products Corporation (the Company) and the EPA, "Consent Agreement re Docket No. TSCA-90-H-18", with respect to Section 8(e). Although the report indicates toxicity to animals, this notice is FOR YOUR INFORMATION ONLY because the information need not be reported under the provisions of Article VII of EPA Statement of Interpretation and Enforcement Policy; Notification of Substantial Risk dated March 16, 1978 (Reference: RTECS Nos. EM 4910000 and EM 4295000).

I am the Vice President and Technical Director of the Company. My address is at Company headquarters:

Halocarbon Products Corporation
887 Kinderkamack Road
River Edge, New Jersey 07611
Phone: 201-262-8899

The address of the Company manufacturing site is:

Halocarbon Products Corporation
1100 Dittman Court
North Augusta, South Carolina 29841
Phone: 803-278-3500

8/16/94

44 pgs.

The appended reports for the chemical mixture of 2,3-dichloro-1,1,1,4,4,4-hexafluoro-2-butene (99.94%) (CAS 374-07-2) and 2-chloro-1,1,1,4,4,4-hexafluoro-2-butene (0.06%) (CAS 400-44-2) were prepared by:

Hazelton Laboratories America, Inc.
1330-B Piccard Drive
Rockville, Maryland 20850

We are not aware of any additional information or supporting technical data.

(The appended reports covered more than one compound so, in connection with this submission, please refer to the data relating to the referenced compound only.)

In summary, the data show:
The LC50 for rats for 15 minutes was found to be 82 ppm. Gross necropsies showed dark lungs, liver, kidneys and adrenals.

Very truly yours,

Louis L. Ferstandig, Ph.D
Vice President & Technical Director

LLF:bc

Plant Butene
(0.06% n-Butene)

26

ACUTE INHALATION EXPOSURES - RATS

QC-74

FINAL REPORT

Submitted to

Halocarbon Products Corporation
Hackensack, New Jersey

December 23, 1968

HAZLETON LABORATORIES, INCORPORATED

FALLS CHURCH, VIRGINIA

Sponsor: Halocarbon Products Corporation

Date: December 23, 1968

Material: QC-74

Subject: FINAL REPORT
Acute Inhalation Exposures - Rats

OBJECTIVE

The objective of this study was to evaluate the effects of a 15-minute inhalation exposure of rats to the vapors of QC-74 at the nominal concentrations of 500, 100 and 25 ppm.

MATERIAL

One small bottle of QC-74 was received from Halocarbon Products Corporation on July 31, 1968. It was a clear colorless liquid with a distinctive odor. For the purposes of this study, it was considered to be free from impurities and used as received.

METHOD

Three groups of animals, each consisting of 10 male rats (mean body weight 203 grams), were exposed to QC-74 for 15 minutes at the nominal concentrations of 500, 100 and 25 ppm, respectively. In addition, 10 male rats in the same weight range were exposed to filtered room air under experimental conditions for 15 minutes and served as a control.

An additional control group, consisting of 10 male rats, was used in conjunction with the exposure at 25 ppm; since the exposures of the rats to the two higher concentrations were separated by a considerable length of time.

Two weeks after the initial exposure to QC-74 vapors at 25 ppm, 10 male rats (five of which had undergone the initial exposure, and five of which were unexposed) were exposed to the vapors of QC-74 at the nominal concentration of 25 ppm.

The exposures were conducted in a 100-liter stainless steel and plexiglas chamber. The experimental atmosphere was generated by bubbling air through the test material, which was placed in a 100-milliliter round bottom boiling flask. The boiling flask was immersed in a constant temperature water bath maintained at 35° C. The air, laden with compound vapor, was then passed through a glass wool trap and a coarse fritted glass disc to remove all aerosol droplets. The temperature of the vapor immediately prior to entry into the chamber was monitored by a thermometer in the inlet tube. The vapor was maintained at ambient temperature.

Chamber airflow was maintained by a positive pressure rotary pump located on the exhaust side of the chamber, and monitored by a flowrator. The desired concentration was attained by proper proportioning of compound vapor and chamber airflow.

The rats were individually housed in a stainless steel mesh cage during exposure. They were observed at frequent intervals for signs of irritation and death.

After exposure, the surviving animals were removed from the chamber and group housed. They were observed for 14 days for latent toxic effects. Gross necropsies were performed on the animals which succumbed and the animals which were sacrificed at the termination of the observation period. All major organs, including the brain, pituitary, thyroid, parathyroids, trachea, lung, heart, liver, spleen, kidneys, adrenals, stomach, pancreas, small intestine, large intestine, urinary bladder, testes, bone, and lymph nodes, were removed, examined for gross pathological signs, and preserved in 10% buffered formalin for possible future histopathological examination.

Statistical analysis was performed on the mortality data.

RESULTS

Control Exposure (500 and 100 ppm)

Ten male rats were exposed for 15 minutes, under experimental conditions, to filtered room air. No signs of irritation were seen, either during exposure or during the 14-day observation period. Gross necropsies were performed at the termination of the observation period. Detailed necropsy findings are presented in Table No. 1.

QC-74 Exposure - 500 ppm

Ten male rats were exposed for 15 minutes to the vapors of QC-74 at the nominal concentration of 500 ppm.

Air was bubbled through the test material at the rate of 685 milliliters/minute. Total chamber airflow was 301 liters/minute. Based on the vapor pressure of QC-74 (which yields a concentration of 220,000 ppm in a 100% saturated atmosphere), a concentration of 500 ppm was attained in this exposure. The nominal concentration, calculated from the ratio of the compound weight loss during exposure to total chamber airflow, was determined to be 6.0 milligrams/liter of air.

During the first 10 minutes of exposure, the animals remained quiet and curled up in their cages and only occasional, brief periods of scratching and preening were observed. A mastication-like movement was seen in several animals after 10 minutes of exposure. In addition, the palpebrae (eyelids) were slightly swollen and the eyes were partially closed of several animals. The respiratory patterns in the rats were slow, deep and regular after 12 minutes of exposure and remained so for the duration of the exposure.

All of the animals were alert and active when returned to group housing following exposure. Slight sneezing was noted in several animals at this time but had disappeared by the end of the day.

One rat succumbed on Day 1 postexposure. The surviving rats had a red-brown incrustation around the palpebrae and the respiratory patterns

were extremely rapid, uneven and labored. Eight rats succumbed by Day 2 postexposure. A rapid, deep and irregular breathing pattern was present in the lone survivor. In addition, a red-brown incrustation was noted around the palpebrae and the nares and the animal appeared unsteady and faltered when it walked. On Day 5, in addition to the aforementioned conditions, the animal seemed weak and appeared pallid. The whole body quivered with each breath. The penis appeared turgid, erect and blue-purple in color and the rat licked it frequently. This animal appeared cyanotic, and succumbed at the end of Day 6 postexposure. A yellow-tan exudate was noted on the penis.

Gross necropsies were performed on all of the animals. Detailed necropsy results are presented in Table No. 1.

QC-74 Exposure - 100 ppm

One rat was taking short, deep breaths after six minutes of exposure and one rat had its eyes closed after 13 minutes of exposure. Otherwise, the animals remained quiet and alert throughout the exposure. Within one hour of the termination of the exposure, the eyes of approximately one-half of the animals were closed. A mastication-like movement and deep yawns were observed in one animal. At the end of the day of exposure, all animals appeared completely normal.

On Day 1 postexposure, the respiratory patterns in the rats were slightly more rapid than normal. Three rats succumbed by the morning of Day 2 postexposure. The remaining rats had varying amounts of red-brown

incrustation surrounding the external nares. In addition, the breathing was very rapid and shallow and the ears and feet were pallid. The animals appeared to have difficulty in locomotion and many were seen stretching the posterior portions of their bodies. Three more rats succumbed during the afternoon of Day 2. The surviving rats were sacrificed at the termination of the 14-day observation period. Detailed gross necropsy findings for all animals are presented in Table No. 1.

Control Exposure (25 ppm)

Five male rats were exposed to filtered room air, under experimental conditions, for 15 minutes. No signs of irritation were seen, either during exposure or during the 28-day observation period. Gross necropsies were performed at the termination of the observation period. Detailed necropsy findings are presented in Table No. 2.

QC-74 Exposure - 25 ppm

Air was bubbled through the test material at the rate of 100 milliliters/minute. Total chamber airflow was 880 liters/minute. Based on the vapor pressure of QC-74 (which yields a concentration of 220,000 ppm in a 100% saturated atmosphere), a concentration of 25 ppm was attained.

First Exposure:

Ten male rats were exposed for 15 minutes to the vapors of QC-74 at the nominal concentration of 25 ppm. The nominal concentration of QC-74 in the experimental atmosphere was determined to be 1.09 milligrams/liter of air.

The breathing pattern in several animals was slightly deeper and more pronounced than normal after five minutes of exposure. The animals were alert, inquisitive, and active for the first 10 minutes of exposure. Thereafter, they became more quiet, but remained alert at all times. All rats appeared completely normal when returned to group housing following exposure.

On Day 1 postexposure, the respiratory pattern in all of the animals was rapid and shallow. Several rats had a red-brown incrustation surrounding the external nares. One rat succumbed approximately 36 hours after exposure.

By Day 6 postexposure, the condition of the survivors had improved and the respiratory pattern was only slightly more rapid than normal. On Day 7, all animals appeared completely normal. On Day 9, two rats appeared lethargic, their heads were declined, and they exhibited extremely irregular respiratory patterns. One of these rats appeared normal by Day 12, and the other succumbed on Day 12. The eight survivors appeared completely normal throughout the remainder of the observation period. Five of these animals were re-exposed to QC-74 at the nominal concentration of 25 ppm 14 days after the original exposure. Detailed gross necropsy results are presented in Table No. 2.

Second Exposure:

Ten male rats were exposed for 15 minutes to the vapors of QC-74 at the nominal concentration of 25 ppm. Five of these rats had been exposed to

QC-74 at the nominal concentration of 25 ppm for 15 minutes 14 days prior to the present exposure. The remaining five rats had not been previously exposed. The nominal concentration of QC-74 in the experimental atmosphere was determined to be 1.20 milligrams/liter of air.

The animals preened, sniffed and scratched for the first few minutes of the exposure. After seven minutes of exposure, one-half of the animals were quiet and after 12 minutes of exposure all of the animals were quiet. No differences were observed between the compound's effects on the animals which had been exposed to QC-74 previously, and its effects on the animals which had not been exposed previously. The animals appeared completely normal when returned to group housing following exposure.

Slightly rapid, shallow respiration was noted in the animals through Day 5 postexposure. One animal, which had undergone both exposures to QC-74, had lost its equilibrium and moved with its head tilted to one side by Day 5. This condition persisted throughout the remainder of the observation period. All other animals appeared normal after Day 5.

Detailed gross necropsy findings are presented in Table No. 2.

Statistical analysis was performed on the mortality data in conjunction with the mortality data for the rats exposed to QC-74 at 500, 100 and 25 ppm. Results of this analysis are presented in Tables No. 3, No. 4, and No. 5, and in Figures No. 1, No. 2, and No. 3.

SUMMARY

Control Exposure (500 and 100 ppm)

Ten male rats were exposed to filtered room air, under experimental conditions, for 15 minutes. No signs of irritation were seen during exposure or during the 14-day observation period. Gross necropsies revealed no abnormalities in two animals. Abnormalities seen included small circular red, brown, and light brown spots and large discolored areas on the lungs.

QC-74 Exposure - 500 ppm

Ten male rats were exposed to QC-74 vapors at the nominal concentration of 500 ppm for 15 minutes. Signs of irritation seen during exposure included slightly swollen palpebrae, a mastication-like movement and slow, deep and even breathing patterns. A red-brown incrustation surrounding the nares, and extremely rapid, uneven, labored respiratory patterns were observed in the rats on Day 1 postexposure. One rat succumbed on Day 1, eight on Day 2, and one on Day 5 postexposure. Gross necropsy findings included firm, dark purple to black lungs, fine red lines on the trachea, dark purple to black liver, smooth dark spleen, maroon adrenals, discolored kidneys and thick red fluid in the intestines.

QC-74 Exposure - 100 ppm

Ten male rats were exposed to QC-74 vapors at the nominal concentration of 100 ppm for 15 minutes. Signs of irritation seen during exposure included

eye closure and a mastication-like movement. The breathing pattern in the rats on Day 1 through Day 3 postexposure was rapid and shallow. Six animals succumbed on Day 2. Gross necropsy findings included dark purple to black lungs, discolored heart, dark purple to black liver, discolored kidneys, maroon adrenals, and thick red fluid in the intestines. Gross necropsies performed on the surviving four animals at the termination of the 14-day observation period revealed red, brown and white areas of discoloration on the lungs and pale brown adrenals.

Control Exposure (25 ppm)

Five male rats were exposed to filtered room air, under experimental conditions, for 15 minutes. No signs of irritation were seen, either during exposure or during the 14-day observation period. Gross necropsy findings included areas of discoloration on the lung surface.

QC-74 Exposure - 25 ppm

Ten male rats were exposed to the vapors of QC-74 at the nominal concentration of 25 ppm for 15 minutes. No signs of irritation were seen during exposure. Signs of irritation seen during the 14-day observation period included rapid shallow respiratory patterns, and a red-brown incrustation around the external nares. Two rats succumbed (36 hours postexposure and 12 days postexposure).

Five of the eight survivors plus five unexposed male rats were exposed to QC-74 at the nominal concentration of 25 ppm for 15 minutes 14 days after the initial exposure. Slight restlessness was noted during

exposure. Signs of irritation observed during the 14-day observation period included rapid, shallow respiratory patterns. The effects on the previously exposed rats were not noticeably different from the effects on the unexposed rats. Gross necropsy findings in all groups included crooked, slit-like indentations, and various sized, shaped and colored areas of discoloration on the surface of the lungs.

Submitted by N. A. Littlefield
NEIL A. LITTLEFIELD, Ph.D.
Staff Scientist
Inhalation Division

Supervision: Mitterer
Experimental: Nemirow

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Table No. 1 - Gross necropsy findings.

GROSS ABNORMALITIES	CONTROL										500 PPM										100 PPM									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
None	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lungs:																														
All lobes-firm, dark purple to black in color with scattered, irregularly-shaped areas of bright red to dark pink	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
All lobes-smooth, firm, dark purple to black in color	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-
All lobes-dark red to purple in color with bright red borders	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	-	-	-	-
Entire lobe-firm, dark purple to black in color with scattered, irregularly-shaped areas of bright red to dark pink - cardiac lobe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
- intermediate lobe	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
- left lung	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Entire lobe-firm, dark purple in color with scattered gray areas - apical lobe	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- cardiac lobe	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- diaphragmatic lobe	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table No. 1 - continued

GROSS ABNORMALITIES	CONTROL										500 PPM										1000 PPM									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
Lungs - continued																														
Entire lobe-dark purple in color with light reddish borders - apical lobe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
- cardiac lobe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
- diaphragmatic lobe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- intermediate lobe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- left lung	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Entire lobe-firm, rough, yellow-brown in color - cardiac lobe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
- diaphragmatic lobe	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
- intermediate lobe	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
Entire lobe-reduced in size, shiny, smooth-appearing, reddish-gray in color - apical lobe	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Large area-yellow-brown in color - left lung-single	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Large area-shiny, smooth-appearing, depressed reddish-gray in color - cardiac lobe-single	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Small, circular, discrete, red areas of discoloration - apical lobe - several	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
- many	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- cardiac lobe - several	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- many	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- diaphragmatic lobe - several	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- many	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- left lung - many	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- all lobes - several	-	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table No. 1 - continued

GROSS ABNORMALITIES	CONTROL 1	2	3	4	5	6	7	8	9	10	500 PPM 1	2	3	4	5	6	7	8	9	10	1000 PPM 1	2	3	4	5	6	7	8	9	10
Lungs - continued																														
Medium-sized, circular, discrete, red areas of discoloration - apical lobe - many	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
- cardiac lobe - many	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- diaphragmatic lobe - many	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
- left lung - many	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Large, circular, discrete, red areas of discoloration - apical lobe - many	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
- left lung - many	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
Small, irregularly-shaped, discrete, light brown areas of discoloration - all lobes - several	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Medium-sized, irregularly-shaped discrete, light brown areas of discoloration - all lobes - several	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Small, circular, discrete, brown areas of discoloration - left lung - several	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-
- all lobes - several	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-
Large, irregularly-shaped discrete, white area of discoloration - apical lobe - single	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
Thin film connecting lobes, cardiac and diaphragmatic lobes	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table No. 1 - continued

GROSS ABNORMALITIES	CONTROL										500 PPM										1000 PPM									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
Lungs - continued																														
Adhesions between lungs and sternum	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Adhesions between lungs and thoracic cavity wall	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thoracic cavity:																														
Contains gray fluid	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trachea:																														
Red in color	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Fine red lines on surface	-	-	-	-	-	-	-	-	-	-	X	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Contains foam	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-
Heart:																														
Pale red in color	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Coronary veins - dark and pronounced	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	X	-	-	-	-
Ventricles appear abnormally small in proportion to auricles	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Air bubble beneath pericardium	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-
Right ventricle-dark purple to black; left ventricle-light red	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-

Table No. 1 - continued

GROSS ABNORMALITIES	CONTROL										500 PPM										100 PPM									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
Thymus:																														
Pink in color	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fine red lines on surface	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Diaphragm:																														
Anterior surface coated with fat-like material	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Liver:																														
Dark purple to black in color	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	X	-	-	X	X	X	X	X	X	-	-	-	-	-
Mottled with large dark gray areas	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Spleen:																														
Abnormally large	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Smooth	-	-	-	-	-	-	-	-	-	-	X	X	X	-	X	X	-	-	-	-	-	-	-	-	-	-	X	-	-	-
Light red in color	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Red-purple in color	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X	X	-	-	-	-	-	-	-	-	-	-	X	-	-	-
Mottled with gray areas	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Kidneys:																														
Surface-mottled with black areas	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-
Surface-mottled with dark gray areas	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-

Table No. 1 - continued

GROSS ABNORMALITIES	CONTROL										500 PPM										100 PPM									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
Kidneys - continued																														
Interior-hollow (right kidney only)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Interior-monochromatic (dark purple to maroon)	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	X	-	X	-	-	X	X	-	-	-	-
Cortices-light brown in color	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-	-	-
Cortices-brown in color	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Medullae-dark purple to black in color	-	-	-	-	-	-	-	-	-	-	X	-	-	-	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Medullae-red in color	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Medullae-spongy in appearance	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Medullae-two black bands on either side	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dark zone at corticomedullary junction	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pelves-red in color	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Pelves-pink to dark pink in color	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X	X	-	-	-	-	-	-
Adrenals:																														
Purple in color	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Maroon in color	-	-	-	-	-	-	-	-	-	-	-	X	X	-	X	X	X	-	X	-	X	-	X	-	X	-	-	-	-	-
Pale brown in color	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X

Table No. 1 - continued

GROSS ABNORMALITIES	CONTROL										500 PPM										100 PPM									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
Stomach:																														
Light red walls with dark red streaks on surface	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-
Thick yellow-brown fluid within	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-	-
Yellow frothy material within	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-
Intestines:																														
Scattered red areas on surface	-	-	-	-	-	-	-	-	-	-	X	X	X	-	X	X	X	-	-	-	X	X	-	-	-	-	-	-	-	-
Gold-brown areas on surface	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Thick red fluid within	-	-	-	-	-	-	-	-	-	-	X	X	X	-	X	X	X	-	-	-	X	X	-	X	-	-	-	-	-	-
Watery red fluid within	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Thick yellow-brown fluid within	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	X	-	-	-	-
Red-brown fluid within	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-
Urinary Bladder:																														
Salt-like deposits within	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
White caseous material within	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table No. 1 - continued

GROSS ABNORMALITIES	CONTROL										500 PPM										100 PPM									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
Testes:																														
Grossly uneven in size	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Abnormally small	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Raised into the abdominal cavity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	X	-	-	-	-
Adhered to scrotum-right testis only	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scrotum:																														
Red, vascular and chafed in appearance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Brain:																														
Prominent dark red veins on surface	-	-	-	-	-	-	-	-	-	-	X	X	X	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Soft	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table No. 2

Key

Control - Exposed to filtered room air, under experimental conditions, for 15 minutes.

Experimental - Group A - Underwent Exposure No. 1 to QC-74 at nominal concentration of 25 ppm for 15 minutes.

- Group B - Underwent Exposures No. 1 and 2 to QC-74 at nominal concentration of 25 ppm for 15 minutes each.

- Group C - Underwent Exposure No. 2 to QC-74 at nominal concentration of 25 ppm for 15 minutes.

Table No. 2 - Gross necropsy findings.

GROSS ABNORMALITIES	CONTROL					GROUP A					GROUP B					GROUP C				
	1	2	3	4	5	1*	2*	3	4	5	1	2	3	4	5	1	2	3	4	5
None	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lungs:																				
No significant findings	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
All lobes-dark red to purple in color	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
All lobes-encased in tan-yellow, jelly-like material	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Entire lobe-comprised of firm, rounded, yellow-green nodules filled with pus-like material - intermediate lobe	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Crooked, tan-gray, slit-like indentation across surface of lung - apical lobe-single	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
- left lung-single	-	-	-	-	-	-	-	X	-	-	-	-	X	-	-	-	-	-	-	-
- left lung-several	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-
Long, thin, irregularly-shaped, depressed, firm, tan area - apical lobe-single	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Large, square, discrete, yellow-white area - apical lobe-single	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- diaphragmatic lobe-single	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Small, circular, discrete, red areas of discoloration - all lobes-several	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	X	-	-	-	-
- apical lobes-several	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
- cardiac lobe-several	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-many	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- diaphragmatic lobe -several	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
-many	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* Succumbed during 14-day observation period.

Table No. 2 - continued

GROSS ABNORMALITIES	CONTROL					GROUP A					GROUP B					GROUP C				
	1	2	3	4	5	1*	2*	3	4	5	1	2	3	4	5	1	2	3	4	5
Lungs - continued																				
- left lung-single	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
-several	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Medium-sized, circular, discrete red area of discoloration with dark red center - left lung-single	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
Small, circular, diffuse, red areas of discoloration - all lobes-several	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-
- apical lobe-several	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
- cardiac lobe-several	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
- diaphragmatic lobe-several	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
Tiny, irregularly-shaped, discrete, red areas of discoloration - all lobes-several	-	-	-	-	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-
Small, irregularly-shaped, discrete, red areas of discoloration - all lobes-many	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-
Small, irregularly-shaped, discrete, raised, red areas of discoloration - apical lobe-several	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
- cardiac lobe-several	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
- diaphragmatic lobe-several	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
- left lung-many	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
Small, irregularly-shaped, discrete, depressed, red areas of discoloration - apical lobe-several	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
- cardiac lobe-several	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
- diaphragmatic lobe-several	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
- left lung-many	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-

* Succumbed during 14-day observation period.

Table No. 2 - continued

GROSS ABNORMALITIES	CONTROL					GROUP A					GROUP B					GROUP C				
	1	2	3	4	5	1*	2*	3	4	5	1	2	3	4	5	1	2	3	4	5
Lungs - continued																				
Small, irregularly-shaped, discrete, depressed, light brown areas of discoloration - all lobes-many	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
- apical lobe-several	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
- cardiac lobe-several	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
- diaphragmatic lobe-several	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
- left lung-many	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
Large, irregularly-shaped, discrete, light brown area of discoloration - left lung-single	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Large, irregularly-shaped, discrete, raised, light brown area of discoloration - cardiac lobe-single	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
Tiny, circular, discrete, depressed brown areas of discoloration - all lobes-many	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-
Tiny, irregularly-shaped, discrete, depressed, brown areas of discoloration - all lobes-many	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-
Small, circular, discrete, brown areas of discoloration - all lobes-several	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-
- apical lobe-several	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
- cardiac lobe-several	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
- diaphragmatic lobe-several	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
- left lung-several	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* Succumbed during 14-day observation period.

Table No. 2 - continued

GROSS ABNORMALITIES	CONTROL					GROUP A					GROUP B					GROUP C				
	1	2	3	4	5	1*	2*	3	4	5	1	2	3	4	5	1	2	3	4	5
Lungs - continued																				
Medium-sized, irregularly-shaped, discrete, red areas of discoloration - all lobes - several	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-
Medium-sized, irregularly-shaped, diffuse, red areas of discoloration - all lobes-several	-	-	-	X	X	-	-	-	-	-	X	-	X	X	X	X	X	-	-	X
-many	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-
- left lung-several	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Small, circular, discrete, light brown areas of discoloration - left lung-several	-	X	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
Tiny, irregularly-shaped, discrete, light brown areas of discoloration - all lobes -several	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
-many	-	-	X	-	-	-	-	-	-	-	X	-	-	-	-	X	-	X	-	X
Tiny, irregularly-shaped, discrete, raised, light brown areas of discoloration - all lobes-many	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- left lung-many	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Small, irregularly-shaped, discrete, raised, light brown areas of discoloration - all lobes-many	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-
- apical lobe-several	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
- cardiac lobe-several	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
- diaphragmatic lobe-several	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
- left lung-many	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-

* Succumbed during 14-day observation period.

Table No. 2 - continued

GROSS ABNORMALITIES	CONTROL					GROUP A					GROUP B					GROUP C				
	1	2	3	4	5	1*	2*	3	4	5	1	2	3	4	5	1	2	3	4	5
Lungs - continued																				
Small, circular, diffuse, brown areas of discoloration - all lobes-several	-	-	-	-	X	-	-	-	X	-	-	-	-	X	-	X	-	-	X	-
- apical lobe-several	-	-	-	X	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
- cardiac lobe-several	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
- diaphragmatic lobe-several	-	-	-	X	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-
- intermediate lobe-several	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- left lung-single	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X
-several	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Medium-sized, circular, diffuse, brown area of discoloration with darker center - cardiac lobe-single	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- diaphragmatic lobe-single	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
- left lung-several	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Small, irregularly-shaped, discrete, brown areas of discoloration - all lobes-many	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-
Medium-sized, irregularly-shaped, discrete brown areas of discoloration - all lobes-several	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-
Medium-sized, irregularly-shaped, diffuse, brown areas of discoloration - all lobes-several	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-
Medium-sized, irregularly-shaped, discrete shiny, smooth-appearing, depressed, reddish-gray area of discoloration - apical lobe-single	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-

* Succumbed during 14-day observation period.

Table No. 2 - continued

GROSS ABNORMALITIES	CONTROL					GROUP A					GROUP B					GROUP C				
	1	2	3	4	5	1*	2*	3	4	5	1	2	3	4	5	1	2	3	4	5
Lungs - continued																				
Small, circular, discrete, raised, white area of discoloration - apical lobe-single	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-
Medium-sized, irregularly-shaped diffuse, white areas of discoloration - all lobes-several	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
- all lobes-many	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
Liver:																				
Black in color	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Mottled	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Dark red periphery	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
Kidneys:																				
Soft	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Monochromatic interior (dark purple)	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Spleen:																				
Black	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
Heart:																				
Encased in tan-yellow, jelly-like material	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-

* Succumbed during 14-day observation period.

Table No. 2 - continued

GROSS ABNORMALITIES	CONTROL					GROUP A					GROUP B					GROUP C				
	1	2	3	4	5	1*	2*	3	4	5	1	2	3	4	5	1	2	3	4	5
Brain:																				
Pink in color	-	-	-	-	-	X		-	-	-	-	-	-	-	-	-	-	-	-	-
Pancreas:																				
Dark pink in color	-	-	-	-	-	-		-	-	-	-	-	X	-	-	-	-	-	-	-
Testes:																				
Raised and located in abdominal cavity	-	-	-	-	-	X		-	-	-	-	-	-	-	-	-	-	-	-	-

* Succumbed during 14-day observation period.

Table No. 3 - Determination of LC_{50} as of Day 2 postexposure.

DOSE-RESPONSE EVALUATION

PROJECT NO. 147-123 COMPOUND QC-74

LH NO. SPECIES RAT SEX M AGE ADULT
ROUTE INHAL. ENDPOINT MORTALITY OBS.PERIOD 2 DAYS

DOSAGE LEVEL PPM	RESPONDING/NO.IN GROUP
25.0000	1/ 20
100.0000	6/ 10
500.0000	9/ 10

PROBIT = 0.329 + 2.311 LOG DOSE D.F.= 1 CHI-SQUARE = 1.0615

LITCHFIELD AND WILCOXON SLOPE = 2.708

P	LC(P) PPM	95 PERCENT CONFIDENCE LIMITS LOWER PPM	UPPER PPM
1	10.3308	3.4775	30.6897
10	29.2535	14.7132	58.1632
50	104.8891	61.4899	178.9190
90	376.0818	149.1101	948.5449
99	1064.9441	270.1411	4198.1919

Table No. 4 - Determination of LC_{50} as of Day 6 postexposure.

DOSE-RESPONSE EVALUATION

PROJECT NO. 147-123 COMPOUND QC-74

LH NO. SPECIES RAT SEX M AGE ADULT
ROUTE INHAL. ENDPOINT MORTALITY OBS.PERIOD 6 DAYS

DOSAGE LEVEL PPM	RESPONDING/NO.IN GROUP
25.0000	1/ 20
100.0000	6/ 10
500.0000	10/ 10

ROBIT = -0.391 + 2.751 LOG DOSE D.F.= 1 CHI-SQUARE = 0.3022

LITCHFIELD AND WILCOXON SLOPE = 2.308

P	LC(P) PPM	95 PERCENT CONFIDENCE LIMITS LOWER PPM	UPPER PPM
1	12.9946	5.1069	33.0651
10	31.1455	17.1486	56.5665
50	91.0147	56.0245	147.8582
90	265.9675	116.6353	606.4934
99	637.4676	190.4720	2133.4591

Table No. 5 - Determination of LC_{50} as of Day 12 postexposure.

DOSE-RESPONSE EVALUATION

PROJECT NO. 147-123 COMPOUND QC-74

LH NO. SPECIES RAT SEX M AGE ADULT
ROUTE INHAL. ENDPOINT MORTALITY OBS.PERIOD 12DAYS

DOSAGE LEVEL PPM	RESPONDING/NO.IN GROUP
25.0000	2/ 20
100.0000	6/ 10
500.0000	10/ 10

PROBIT = 0.383 + 2.405 LOG DOSE D.F.= 1 CHI-SQUARE = 0.0442

LITCHFIELD AND WILCOXON SLOPE = 2.604

P	LC(P) PPM	95 PERCENT CONFIDENCE LIMITS LOWER PPM	UPPER PPM
1	8.9516	3.0491	26.2797
10	24.3317	12.4317	47.6226
50	82.9695	49.9553	137.8018
90	282.9204	115.1043	695.4026
99	769.0126	200.3326	2951.9891

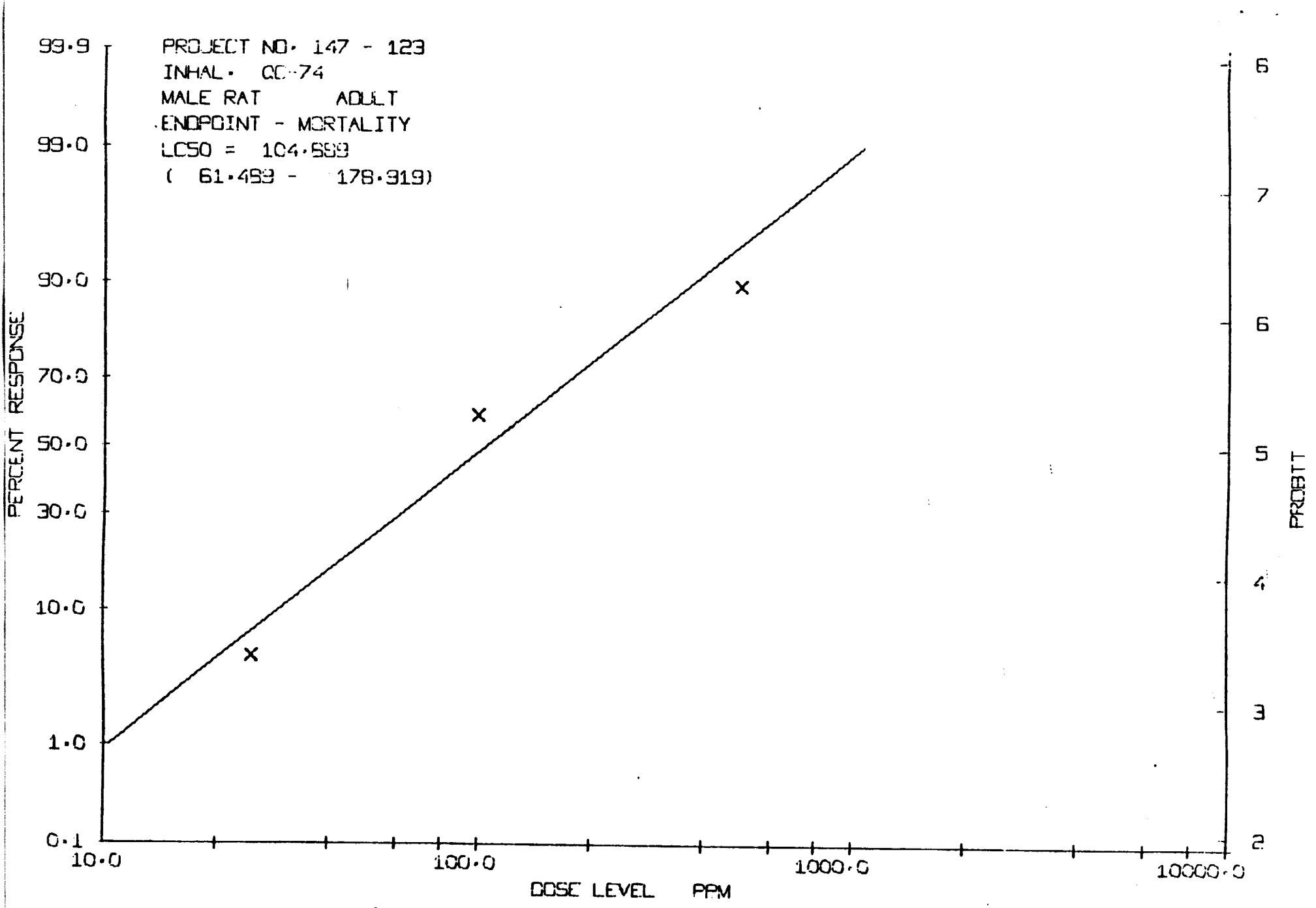

Figure No. 1 - LC_{50} determination as of Day 2 postexposure.

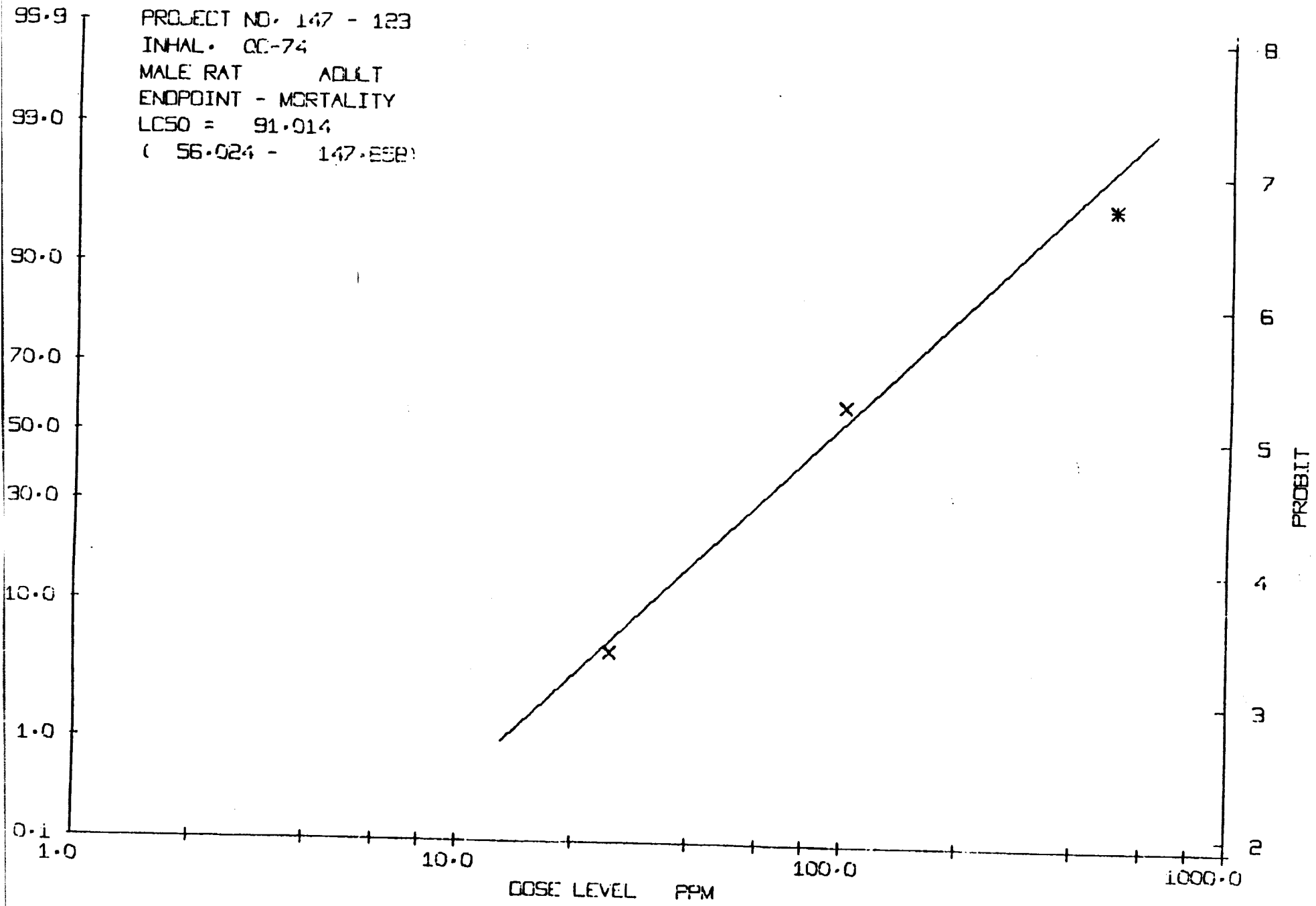

Figure No. 2 - LC_{50} determination as of Day 6 postexposure.

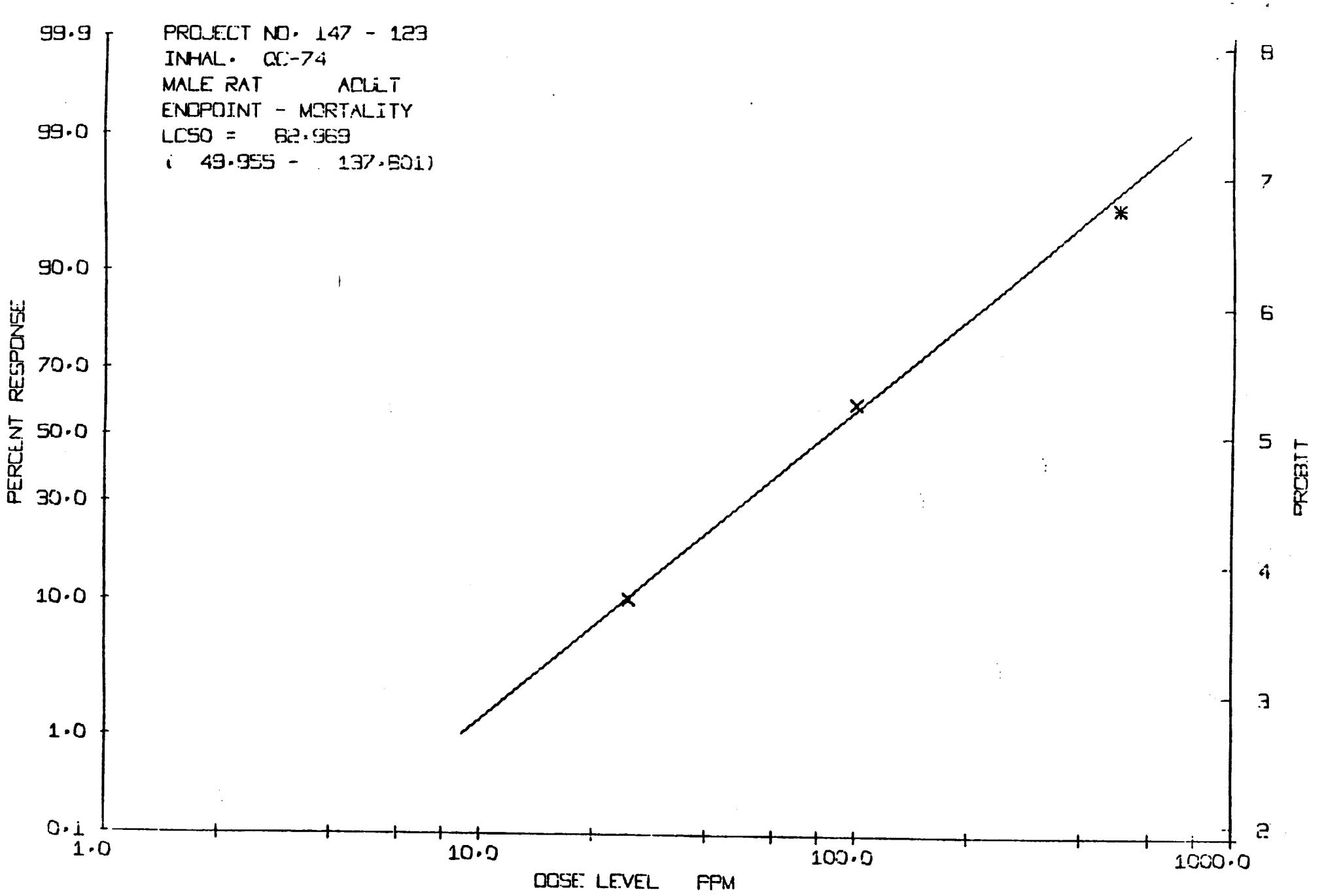

Figure No. 3 - LC_{50} determination as of Day 12 postexposure.

(26)

ACUTE INHALATION EXPOSURES - RATS

QC-73
QC-74

ADDENDUM TO FINAL REPORT

Submitted to

Halocarbon Products Corporation
Hackensack, New Jersey

January 16, 1969

HAZLETON LABORATORIES, INC.
TRW LIFE SCIENCES CENTER

SPONSOR: Halocarbon Products Corporation DATE: January 16, 1969

MATERIALS: QC-73
QC-74

SUBJECT: ADDENDUM TO FINAL REPORT
Acute Inhalation Exposure - Rats

SUMMARY

QC-73

Four groups of 10 male rats per group were exposed to QC-73 at concentrations of 100, 150, 250, and 500 ppm, respectively, for 15 minutes and observed for toxicological signs and death for 14 days. The LC_{50} was determined. The corresponding LC_{50} data are found in Table No. 1 and Figure No. 1. These correspond to Table No. 5 and Figure No. 3 of the original report. The LC_{50} was found to be 147 ppm with 95% confidence limits of 124 to 173 ppm.

QC-74

Three groups of 10 male rats per group were exposed to QC-74 at concentrations of 25, 100, and 500 ppm, respectively, for 15 minutes and observed for toxicological signs and death for 14 days. These data were used to determine the LC_{50}. The corresponding LC_{50} data are found in Table No. 2 and Figure No. 2. These correspond to Table No. 5 and Figure No. 3 of the original report. The LC_{50} was found to be 82 ppm with 95% confidence limits of 49 to 137 ppm.

Submitted by N. A. Littlefield
NEIL A. LITTLEFIELD, Ph.D.
Staff Scientist
Inhalation Division

ljt

Table No. 1 - Determination of LC_{50} as of Day 4 postexposure.

DOSE-RESPONSE EVALUATION

PROJECT NO. 147-122 COMPOUND QC-73

LH NO. SPECIES RAT SEX M AGE ADULT
ROUTE INHAL. ENDPOINT MORTALITY OBS.PERIOD 4 DAYS

DOSAGE LEVEL PPM	RESPONDING/NO.IN GROUP
100.0000	0/ 10
150.0000	6/ 10
250.0000	10/ 10
500.0000	10/ 10

PROBIT =-12.967 + 8.288 LOG DOSE D.F.= 1 CHI-SQUARE = 0.5210

LITCHFIELD AND WILCOXON SLOPE = 1.320

P	LC(P) PPM	95 PERCENT CONFIDENCE LIMITS LOWER PPM	UPPER PPM
1	77.1136	51.8199	114.7534
10	103.0805	79.9585	132.8886
50	147.1651	124.7536	173.6027
90	210.1032	159.6423	276.5139
99	280.8523	184.2183	428.1767

Table No. 2 - Determination of LC_{50} as of Day 12 postexposure.

DOSE-RESPONSE EVALUATION

PROJECT NO. 147-123 COMPOUND QC-74

LH NO. SPECIES RAT SEX M AGE ADULT
ROUTE INHAL. ENDPOINT MORTALITY OBS.PERIOD 12DAYS

DOSAGE LEVEL PPM	RESPONDING/NO.IN GROUP
25.0000	2/ 20
100.0000	6/ 10
500.0000	10/ 10

PROBIT = 0.383 + 2.405 LOG DOSE D.F.= 1 CHI-SQUARE = 0.0442

LITCHFIELD AND WILCOXON SLOPE = 2.604

P	LC(P) PPM	95 PERCENT CONFIDENCE LIMITS LOWER PPM	UPPER PPM
1	8.9516	3.0491	26.2797
10	24.3317	12.4317	47.6226
50	82.9695	49.9553	137.8018
90	282.9204	115.1043	695.4026
99	769.0126	200.3326	2951.9891

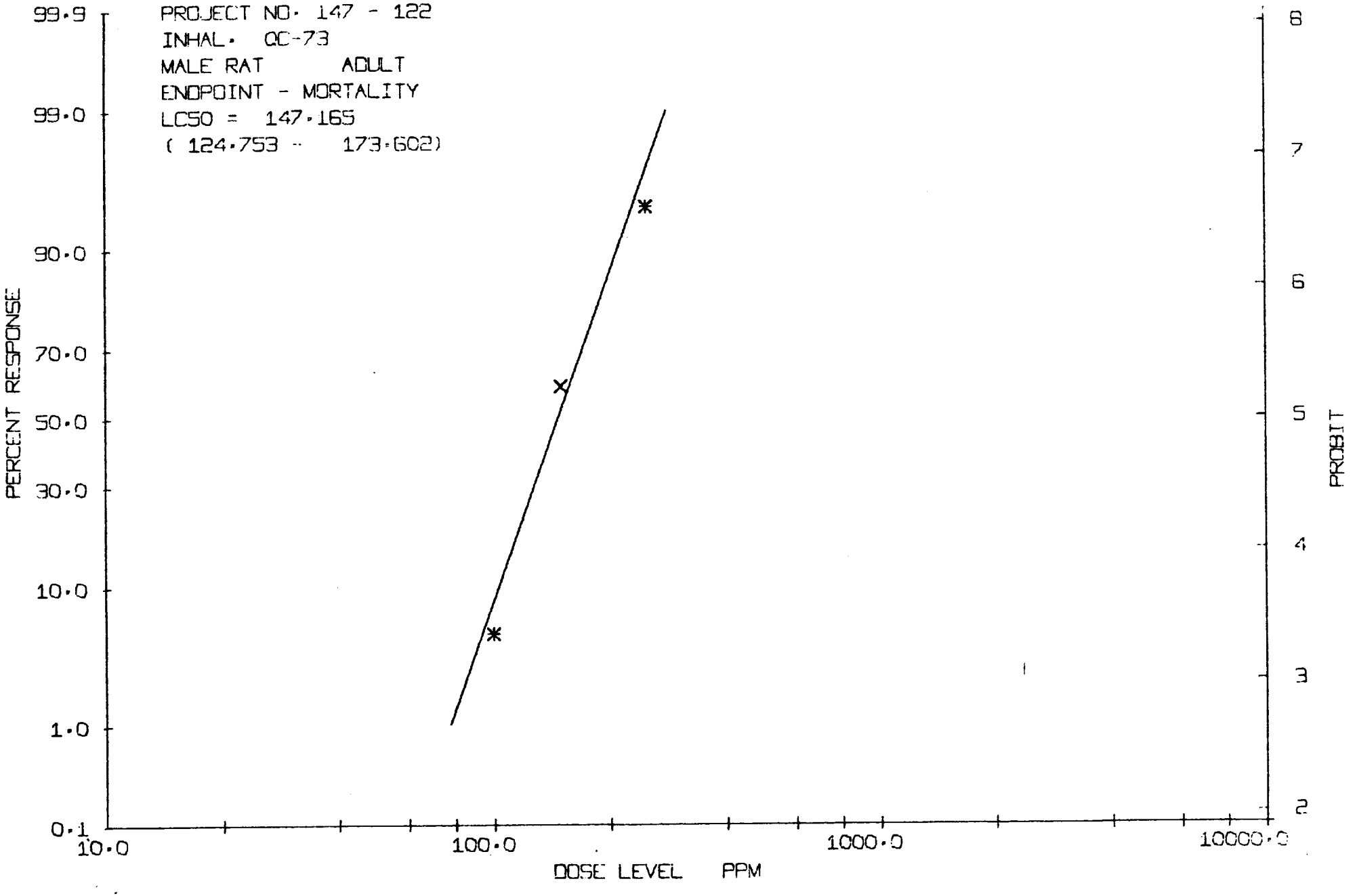

Figure No. 1 - LC_{50} determination as of Day 4 postexposure.

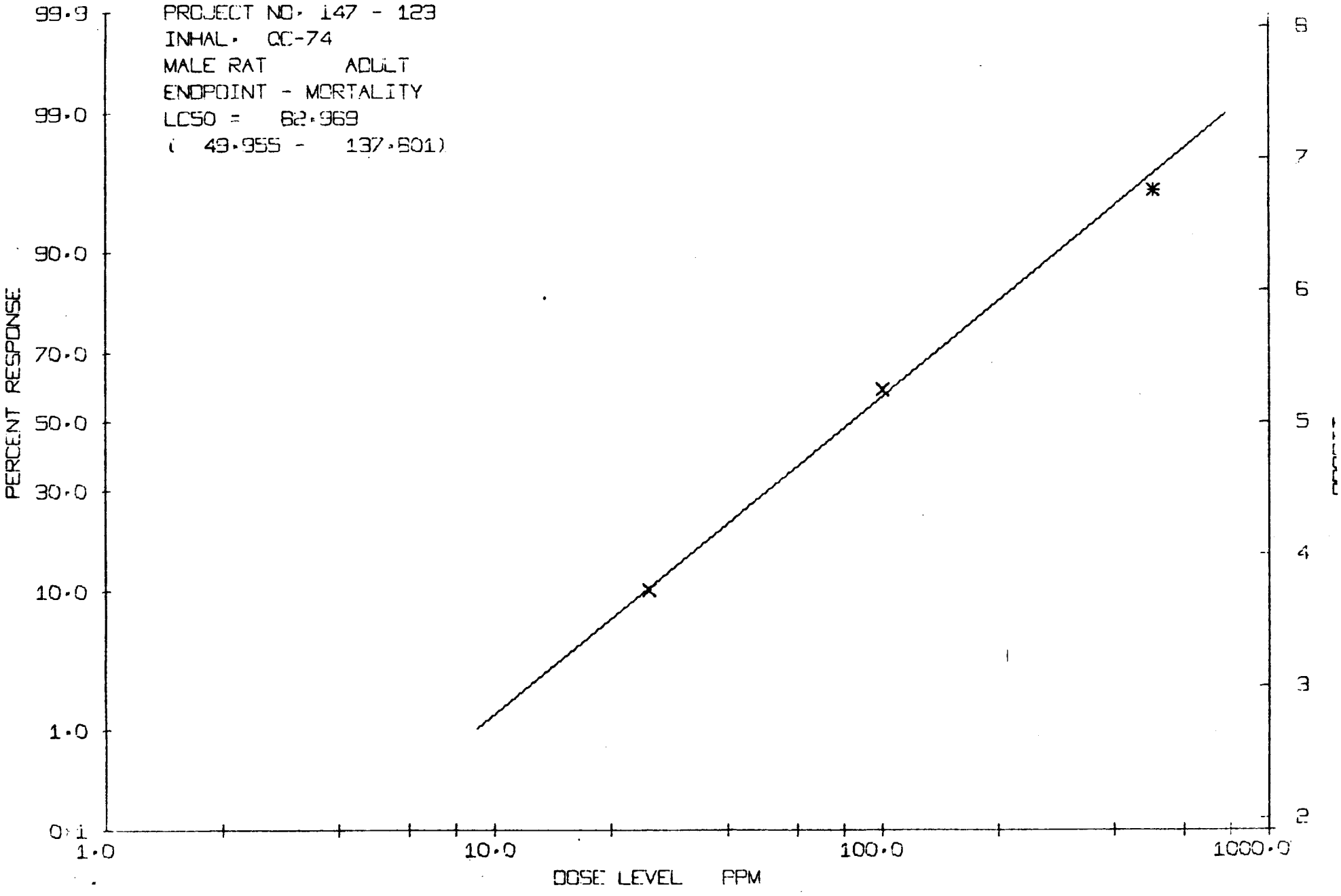

Figure No. 2 - LC_{50} determination as of Day 12 postexposure.

CONTAINS NO CBI

Halocarbon
PRODUCTS CORPORATION

887 KINDERKAMACK ROAD • RIVER EDGE, NEW JERSEY 07661
TELEPHONE: 201-262-8899 FAX: 201-262-0019
MAILING ADDRESS: P.O. BOX 661 • RIVER EDGE, NEW JERSEY 07661

April 7, 1994

Document Processing Center (TS-790)
Attn: Section 8(e) Coordinator
Office of Toxic Substances
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, DC 20460

Re: Consent Order regarding Halocarbon Products Corporation Docket No. TSCA 90-H-18

Dear Sir/Madame:

This submission is made pursuant to the Consent Order referenced above.

Transmitted herewith are reports on the chemicals listed below:

* Trifluoroacetyl chloride (CAS 354-32-5)
** 2-Chloro-1,1,1,4,4,4-hexafluorobutene-2 (CAS 400-44-2)
** Asym dibromodifluoroethylene (CAS 430-85-3)
** 1,1,1,2-Tetrabromo-2,2,-difluoroethane (CAS 3470-67-5)
** 1,3,4,4-Tetrachloro-1,2,3,4-tetrafluoro-1-butene
** $C_4F_6Br_4$ (CAS 375-24-6)
** $C_4F_4Br_4Cl_2$
** $CFCl_2(CF_2CFBr)_nCl$ where $_n$ is approximately 2 to 5
** $CFClBr(CF_2CFBr)_nBr$ where $_n$ is approximately 5 to 10
** $CFClBr(CF_2CFBr)_nBr$ where $_n$ is approximately 4 to 8
** $CFClBr(CF_2CFBr)_nBr$ where $_n$ is approximately 2 to 5
** $CFCl_2(CF_2CFBr)_nCl$ where $_n$ is approximately 3 to 6
** $CFCl_2(CF_2CFBr)_nCl$ where $_n$ is approximately 4 to 8
** 1,1,1,4,4,4-Hexafluoro-2-butanone
** 2-Hydroxy-1,1,1,4,4,4-hexafluorobutane
* 1,1,3,3-Tetrabromo-1,2,2,3-tetrafluoropropane (99%) (CAS 36567-29-0)
** Mixture of 2,3-dichloro-1,1,1,4,4,4-hexafluoro-2-butene (99.94%) (CAS 374-07-2) & 2-chloro-1,1,1,4,4,4-hexafluoro-2-butene (0.06%) (CAS 400-44-2)
** 1,1-Dibromo-1-chloro-2,2,2-trifluoroethane (CAS 754-17-6)
** $Cl(CF_2CFCl)_2Cl$ (CAS 423-38-1)

Reports on chemicals designated by a single asterisk (*) are submitted under paragraph V.F.b of said Consent Order.

Reports on chemicals designated by double asterisks (**) are submitted under paragraph V.F.c on a For Your Information Only basis.

I hereby certify on behalf of Halocarbon Products Corporation that the audit required by said Consent Order has been completed and that to the best of my information and belief the reports listed above are the only reports or studies required or questionably required to be submitted to EPA pursuant to said Concent Order.

Very truly yours,
Halocarbon Products Corporation

By Louis L. Ferstandig
Louis L. Ferstandig, Ph.D
Vice President & Technical Director

LLF:bc
Enclosures