CHRONIC INHALATION TOXICITY STUDY OF 1,2-DICHLOROETHANE (EDC) IN RATS TREATED WITH DISULFIRAM OR ETHANOL

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Sprague-Dawley-rats were used to study the effects of inhaled 1,2-dichloroethane (107062) (EDC) in the presence and absence of disulfiram (97778) in the diet, and with or without ethanol (64175) in the drinking water. Rats were exposed to EDC at 50 parts per million for 7 hours per day, 5 days per week for 24 months. All animals receiving disulfiram showed lower body weight gains, but demonstrated no other changes regarding toxicity, survival or food intake. An increased incidence of liver masses was noted in male and female rats receiving EDC and disulfiram. This finding is in agreement with other findings concerning the synergistic effects of haloethanes and disulfiram. The pharmacological agent greatly enhanced the carcinogenicity of the carcinogen. The high incidence of intrahepatic bile duct cholangiomas in both male and female rats and neoplastic nodules in male rats indicate that the combined EDC/disulfiram treatment must be considered carcinogenic to the liver. Male rats also showed significantly increased interstitial cell tumors of the testes and fibromas of the subcutis. Female rats demonstrated increased incidence of adenocarcinomas of the mammary gland. Kidney lesions were more frequent in the male EDC treatment group.

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PREFACE

This report was prepared at Midwest Research Institute, 425 Volker Boulevard, Kansas City, Missouri 64110, under Contract No. 200-82-2508 with the National Institute for Occupational Safety and Health (NIOSH), Division of Biomedical and Behavioral Science, 4676 Columbia Parkway, Cincinnati, Ohio 45226.

The research was conducted from May 17, 1982, to September 30, 1984, in the Chemical and Biological Sciences Division, Department of Toxicology, Deramus Field Station Facilities, 13100 Robinson Pike Road, Grandview, Missouri 64030. Dr. James M. Cholakis was principal investigator and study director. Inhalation chamber operations, daily and monthly observations, body weight measurements, food and water consumption measurements, and animal husbandry practices were performed by the chamber toxicology staff (Mr. J. Hagensen, Mr. G. K. Liu, Ms. S. D. Peterson, Ms. K. J. Smith, and Ms. D. Williamson). Animal husbandry practices were coordinated by Dr. C. C. Templeman, Veterinarian.

Data coordination, computer operations, and daily scheduling were supervised by Ms. S. D. Peterson and Mr. G. K. Liu. Necropsy and histopathology were performed by Dr. R. Kovatch (Pathology Associates, Inc.) and support staff (Dr. H. D. Hoang and PAI prosectors).

All chemistry operations including generation and analytical monitoring of 1,2-dichloroethane vapor atmospheres, analysis and reanalysis of test compounds, and special chemistry studies were supervised by Mr. D. H. Steele and Mr. A. T. Chatham.

The histopathology evaluation performed at Pathology Associates, Inc., 10075 Tyler Place, Ijamsville, Maryland 21754, is attached to this report as follows: (a) the pathology narrative (materials and methods, results and discussion, conclusion, and summary tables) is found in Appendix 9 of this volume; (b) the individual animal histopathology tabulations is found in Volume 2 of Part I of this report.

The special biochemical study (metabolism, disposition, and DNA binding experiments) is submitted as Part II of this report.

MIDWEST RESEARCH INSTITUTE

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QUALITY ASSURANCE STATEMENT

Chronic Inhalation Toxicity Study of 1,2-Dichloroethane (EDC) in Rats Treated With Disulfiram or Ethanol

The work reported herein was subjected to periodic inspections and audits by the Quality Assurance Unit of Midwest Research Institute in compliance with the Good Laboratory Practices (GLP) regulations (21CFR:58). The critical phase inspections and audits were conducted on the following dates:

1982

August 5
September 20
October 27
November 12
November 12
November 22
November 23

1983

January 5
January 12
February 1
April 20
June 7
June 8
June 15
June 30
July 5
July 15
August 16
August 17
August 24
September 8
October 25
October 28
November 10
November 16
November 21
November 28
December 20

1984

February 7
February 15
March 19
March 29
April 25, 26
April 30
June 8
June 28
August 31
September 18
September 20
September 26
November 30
December 4, 5

All monthly reports were inspected.

Reports were submitted to management on the following dates:

1982

October 27
November 19
November 22

1983

April 20
June 14
June 30
August 18
September 8
October 25
October 28
November 10
December 2
December 20

1984

February 7
May 3
June 28
September 26
November 30
December 19

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The draft final report was reviewed on January 17 and 18, 1985. The complete final report was reviewed on September 9 and 10, 1985.

Raw data and reports are presently stored in the MRI Archives. Tissue specimens sent to Pathology Associates, Inc., Ijamsville, Maryland, for processing will be sent to the sponsor for final archiving.

Eugene G. Podrebarac
Eugene G. Podrebarac, Ph.D.
Manager, Quality Assurance

September 24, 1985
Date

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ABSTRACT

A study of the effects of inhaled 1,2-dichloroethane (EDC) at the current U.S. occupational standard of 50 ppm, with or without disulfiram in the diet, with or without ethanol in the drinking water, was conducted in Sprague-Dawley rats. Fifty (50) animals/sex/group were exposed to 1,2-dichloroethane 7 hr/day, 5 days/week for 24 months in six (6) dose group designations as follows:

I. Control--exposed to filtered air, provided standard rodent diet, and drinking water.

II. Ethanol (ET)--exposed to filtered air, provided standard rodent diet, and 5% ethanol in drinking water.

III. Disulfiram (DS)--exposed to filtered air, provided 0.05% disulfiram in diet, and drinking water.

IV. EDC--exposed to 50 ppm 1,2-dichloroethane, provided standard rodent diet, and drinking water.

V. EDC/DS--exposed to 50 ppm 1,2-dichloroethane, provided 0.05% disulfiram in diet, and drinking water.

VI. EDC/ET--exposed to 50 ppm 1,2-dichloroethane, provided standard rodent diet, and 5% ethanol in drinking water.

Both male and female rat treatment groups receiving disulfiram in the diet (DS and EDC/DS groups) gained significantly less weight when compared with their control groups over the course of the entire study. On the other hand, no noteworthy changes were recorded in clinical signs of toxicity, on survival, or on food and water consumption parameters. However, at necropsy an increased incidence of liver masses were noted in both male and female EDC/DS group, kidney lesions in the male EDC/ET group, and lesions of the testes in the male EDC treatment group.

Under conditions of this study, the EDC/DS combination treatment should be considered carcinogenic for the liver as there was a high incidence of intrahepatic bile duct cholangiomas in both male and female rats and neoplastic nodules (hepatocellular adenomas) in male rats utilizing this dosing regimen. Interstitial cell tumors of the testes and fibromas of the subcutis were also significantly increased in male rats receiving EDC/DS. An increased incidence of adenocarcinomas of the mammary gland observed in female rats is also considered a marginal carcinogenic effect.

I. INTRODUCTION

The basis of nomination of 1,2-dichloroethane [National Cancer Institute (NCI) No. C00511] (ethylene dichloride, EDC) for bioassay was to compare its biological effects to those of other 1,2-dihaloalkanes.

Recent chronic studies have produced contradictory results on the carcinogenicity of EDC. A gavage study (NCI, 1978) found that EDC was carcinogenic to male and female rats and mice. However, an inhalation study in rats found no significant carcinogenicity. Possible explanations of these results include strain differences (B6C3F1 and Sprague-Dawley, respectively), route differences, and an artifact from the effects of unscheduled deaths (Maltoni et al., 1980).

The problem is made more serious by the known effects of the closely related chemical 1,2-dibromoethane (EDB). Research at Midwest Research Institute (MRI), under National Institute for Occupational Safety and Health (NIOSH) Contract No. 210-76-0131, showed that inhaled EDB is carcinogenic and that simultaneous feeding with disulfiram (an alcohol dehydrogenase inhibitor, widely used in the treatment of alcoholism) greatly increased the carcinogenic potency and lethality of EDB. From basic chemistry, one would assume that EDC reactions are substantially similar to those of EDB, implying that a similar disulfiram-EDC synergism exists.

The Chemical Abstracts Service (CAS) Ninth Collective Index (1977) name for this compound is Ethane, 1,2-dichloro- (CAS Registry Number is 107-06-2). The compound is also known as sym-dichloroethane and glycol dichloride.

Although 1,2-dichloroethane is the largest volume synthetic organic chemical manufactured in the United States (Gold, 1980), only about 10 to 15% of 1,2-dichloroethane production is sold commercially. The rest is produced by oxychlorination of ethylene and used captively to produce vinyl chloride. It is also used in the production of 1,1,1-trichloroethane (methylchloroform), trichloroethylene, tetrachloroethylene (perchloroethylene), vinylidene chloride, and ethylene amines. It is a component of most leaded fuels as a lead scavenger. Other minor uses include solvents for extraction of caffeine, perfume oils, and animal fats; textile cleaning; and metal degreasing. It has been used in food packaging adhesives; in fumigants for upholstery, carpets, and grain; in paint, varnish, and finish removers; and in soaps and scouring compounds. Still other minor uses include wetting and penetrating agents, organic synthesis, ore flotation, and as a dispersant for nylon, rayon, styrene-butadiene rubber, and other polymers (Drury and Hammons, 1979; NIOSH, 1978a). Annual United States production in the last decade has ranged from about 3,620,000 to 4,290,000 MT (USITC, 1976-1984).

The following producers were listed in the 1977 inventory taken by the U.S. Environmental Protection Agency (EPA) for the Toxic Substances Control Act: BASF Wyandotte Corporation, B. F. Goodrich Chemical Division, Borden Petrochemical, Continental Oil Company, Diamond Shamrock Corporation, Dow Chemical U.S.A., Ethyl Corporation, Olin Corporation, PPG Industries, Inc., Shell Chemical Company, Stauffer Chemical Company, Union Carbide Corporation, and Vulcan Materials Company (TSCA, 1980).

Acute toxic effects of EDC in laboratory animals most frequently include lowering blood pressure and cardiac impairment. Other acute effects are pulmonary edema, fatty degeneration of the liver and kidney, and degeneration of the adrenal cortex (NIOSH, 1978a).

Humans develop similar symptoms whether the route of acute exposure is ingestion, inhalation, or dermal absorption: nausea, vomiting, dizziness, internal hemorrhaging, cyanosis, rapid but weak pulse, and unconsciousness. Death occurs from respiratory and circulatory failure. Chronic exposure of humans to EDC has been associated with neurologic changes, loss of appetite, other gastrointestinal problems, mucous membrane irritation, liver and kidney impairment, and death (NIOSH, 1978a).

The acute toxicity of EDC has been tested in many laboratory species. Reported oral LD_{50}'s for the mouse, rat, and rabbit are 489, 670, and 860 mg/kg, respectively. The lowest toxic oral dose reported for man is 810 mg/kg. Lowest lethal concentrations (LC_{LO}) in air within a 7-hr exposure period are 1,500 ppm for the guinea pig and 3,000 ppm for the pig and rabbit. The 2-hr inhalation LC_{LO} for the mouse is 2,500 ppm. The lowest toxic inhalation exposure for humans is 4,000 ppm in 1 hr (Tatken and Lewis, 1983).

The permissible exposure limit for EDC promulgated by the Occupational Safety and Health Administration (OSHA) is 50 ppm as a time-weighted average (TWA) for an 8-hr day, 40-hr work week. OSHA regulations include a ceiling value of 100 ppm (200 mg/m^3) and a peak level of 200 ppm for 5 min in any 3-hr period.

NIOSH recommended 1 ppm for a TWA exposure with a 2-ppm ceiling value (NIOSH, 1978a). The American Conference of Governmental Industrial Hygienists (ACGIH) recommend a threshold limit value (TLV) of 10 ppm and a short-term exposure limit (STEL) of 15 ppm/15 min. ACGIH has proposed elimination of the STEL (ACGIH, 1984).

NIOSH (1978a; 1978b) estimated that 200,000 workers are continuously exposed on the job to EDC; 34,000 for as much as 4 hr or more daily. Altogether, a total of approximately 2 million workers are exposed at some time to EDC in nearly 150,000 workplaces. Persons in the general population who work or reside in areas adjacent to industries that produce, consume, or discharge EDC may inhale contaminated air as will persons who spend time near gasoline storage facilities or filling stations.

The sweetish odor of EDC, barely detectable at 50 ppm, is not striking enough so that it serves as sufficient warning of the chronic exposure hazard. Persons become adapted to low concentrations (Clayton and Clayton, 1981).

The mutagenicity of EDC in various test systems depends greatly on their metabolic capabilities. Exposed Drosophila melanogaster exhibit sex-linked recessive lethal mutations, somatic mutations, and nondisjunction of X chromosomes. Barley seeds show increased sterility and point mutations, and pea seedlings, arrested growth. S-9 activation is necessary for the mutagenic effect or enhances it greatly for human lymphocytes in vitro (DNA reparative synthesis enhanced), the Chinese hamster ovary cell/HGPRT culture system (gene mutation), and many Salmonella tester strains. Cytosol, cytosol + GSH, and/or microsomes enhance the activation of EDC to a more potent mutagen. Mutagenic activity was absent in tests with Escherichia coli and in the micronucleus test in mice. The more potent mutagens arising from EDC metabolism have not been identified unequivocally. They may include glutathione or cysteine conjugates and chloroacetaldehyde (Davidson et al., 1982).

Although the older literature reports that exposing female rats to EDC in the air caused embryolethality and increased perinatal mortality, more recent experiments with pregnant rats and rabbits exposed to 100 or 300 ppm for 7 hr/day for 10 or 13 days during pregnancy did not cause embryotoxicity, fetotoxicity, or malformations attributable to EDC. A multigeneration exposure of male and female mice to EDC at up to 290 mg/L in the drinking water (daily dose approximately 50 mg/kg) did not cause any dose-dependent effects on fertility, gestation, viability, or lactation (Davidson et al., 1982).

II. MATERIAL AND METHODS

A. Chemical

1. 1,2-Dichloroethane

a. Procurement and usage: Four lots of EDC were used during the course of this study. All four lots (Lot Nos. 2403TH, 5027EJ, 1420TJ, and 2401HL) consisting of 5, 30, 30 and 12 L, respectively, were purchased from Aldrich Chemical Company, P.O. Box 355, Milwaukee, Wisconsin 53201.

Upon receipt of each lot, reference standards were removed, placed in septum vials, and sealed with aluminum crimp seals and Teflon-faced septa. The reference standards were stored at -20°C. The remainder of the lot was stored at 5°C.

The usage of these lots is summarized below.

Lot No. Used	Dates of Use
2403TH	9/27/82 to 3/17/83
5027EJ	3/18/83 to 11/22/83
1420TJ	11/23/83 to 8/17/84
2401HL	8/18/84 to 9/14/84

b. Identity and purity analysis

(1) Original bulk chemical analyses: The original bulk chemical analyses of each lot were performed under the supervision of the project chemist. The results of these analyses are summarized below. Copies of the reports are contained in Appendix 1.

(a) Lot No. 2403TH: The sample was identified as 1,2-dichloroethane by infrared spectroscopy. Gas chromatographic analysis detected no impurities 0.1% or greater, relative to the major peak, indicating a purity > 99%.

(b) Lot No. 5027EJ: The sample was identified as 1,2-dichloroethane by infrared spectroscopy. Gas chromatographic analysis detected no impurities 0.1% or greater, relative to the major peak, indicating a purity > 99%.

(c) Lot No. 1420TJ: The sample was identified as 1,2-dichloroethane by infrared spectroscopy. Gas chromatographic analysis detected no impurities 0.1% or greater, relative to the major peak, indicating a purity > 99%.

(d) Lot No. 2401HL: The sample was identified as 1,2-dichloroethane by infrared spectroscopy. Gas chromatographic analysis detected one impurity 0.1% or greater, relative to the major peak. Three smaller impurities having areas less than 0.1% relative to the major peak were also detected in the sample. The combined area of the impurity peaks totaled 0.32% of the major peak, indicating a purity > 99%.

(2) Bulk chemical reanalysis: The objective of the bulk chemical reanalysis was to determine whether the purity of the test chemical as received and stored was, and remained, identical to that initially received and analyzed by MRI.

The 1,2-dichloroethane used during this study was analyzed for purity upon receipt and at 4-month intervals thereafter, including analyses within 30 days prior to the start of the study and within 30 days after the last sacrifice. The analyses were conducted by the BioOrganic Chemistry Department at Midwest Research Institute.

The analysis method employed was a determination of purity by gas chromatography. Methodologies for this analysis are given below.

The bioassay sample and the reference standard were analyzed for purity by gas chromatography. The ratio of the sample peak areas to the internal standard peak areas were obtained for the bioassay sample and then normalized to the ratio of the average reference standard to internal standard peak area. The instrument system used is given below.

Instrument: Varian 3700 gas chromatograph
Detection: Flame ionization
Column: 80/100 Carbopack C/0.1% SP-1000, 1.8 m x 4 mm ID; glass
Carrier Gas: Nitrogen
Carrier Gas Flow Rate: 70 cc/min
Detector Temperature: 250°C
Inlet Temperature: 200°C
Column Oven Temperature: 55°C, isothermal
Samples Injected: Solutions of 0.5% (v/v)

In all cases, the obtained results were in good agreement with the original analysis. No significant changes in purity were observed for any of the lots. The reports generated from these analyses are contained in Appendix 1. The cumulative results are presented in Table 1.

2. Disulfiram

a. Procurement and usage: Two lots of disulfiram were used during the course of this study. Both lots (Lot Nos. S062982 and 89C0022) consisting of 1.5 and 2 kg, respectively, were purchased from Sigma Chemical Company, P.O. Box 14508, St. Louis, Missouri 63178.

TABLE 1

CUMULATIVE REANALYSIS RESULTS FOR 1,2-DICHLOROETHANE

Reanalysis Date	Purity Analysis by Gas Chromatography (% of Reference Sample)
9/1/82 Lot No. 2403TH (Original Analysis)	-
12/20/82 Lot No. 2403TH	100.5 ± 1.4(s)%
12/20/82 Lot No. 5027EJ (Original Analysis)	-
4/27/83 Lot No. 5027EJ	100.7 ± 0.1(s)%
8/25/83 Lot No. 5027EJ	100.0 ± 0.1(s)%
1/4/84 Lot No. 5027EJ	99.2 ± 0.5(s)%
10/7/83 Lot No. 1420TJ (Original Analysis)	-
5/4/84 Lot No. 1420TJ	100.0 ± 0.2(s)%
8/14/84 Lot No. 2401HL (Original Analysis)	-

Upon receipt of each lot, reference standards were removed, placed in septum vials, and sealed with aluminum crimp seals and Teflon-faced septa. The reference standards were stored at -20°C. The remainder of the lot was stored at 5°C.

The usage of these lots is summarized below.

Lot No. Used	Dates of Use
S062982	9/14/82 to 12/29/83
89C0022	12/30/83 to 9/24/84

b. Identity and purity analysis

(1) Original bulk chemical analyses: The original bulk chemical analyses of each lot were performed by MRI. The results of these analyses are summarized below. Copies of the reports generated from these analyses are contained in Appendix 2.

(a) Lot No. S062982: The sample was identified as disulfiram by infrared spectroscopy. The elemental analyses for carbon, hydrogen, and nitrogen agreed with the theoretical values, but the analysis for sulfur was slightly low. High performance liquid chromatography indicated one impurity with an area of 0.4% relative to the major peak. Cumulative data indicated that this sample of disulfiram had a purity of 99%.

(b) Lot No. 89C0022: The sample was identified as disulfiram by infrared spectroscopy. The elemental analyses for carbon and nitrogen agreed with the theoretical values, but the analyses for sulfur and hydrogen were slightly low. High performance liquid chromatography indicated two impurities having a combined area of 0.49% relative to the major peak. Cumulative data indicated that this sample of disulfiram had a purity of 99%.

(2) Bulk chemical reanalysis: The objective of the bulk chemical reanalysis was to determine whether the purity of the test chemical after storage remained identical to that received and analyzed by MRI.

The disulfiram used during this study was analyzed for purity upon receipt and at 4-month intervals thereafter, including analyses within 30 days prior to the start of the study and within 30 days after the last sacrifice. The analyses were conducted under the supervision of the project chemist.

The analysis method employed was a determination of purity by high performance liquid chromatography. Methodologies for this analysis are given below.

The bioassay sample and the reference standard were analyzed for purity by high performance liquid chromatography. The ratios of the sample peak areas to the internal standard peak areas were obtained for the bioassay sample and then normalized to the ratio of the average reference standard to internal standard peak area. The instrument system used is given below.

Pump: Waters Model 6000
Detector: Waters Model 440, 254 mm, 2.0 AUFS
Injector: Waters Intelligent Sample Processor
Column: Varian Micro Pak MCH-10, 300 mm x 4 mm ID
Flow Rate: 2.0 mL/min
Mobile Phase: Water:Methanol, 250:750 v/v

In all cases, the obtained results were in good agreement with the original analysis. No significant changes in purity were observed for any of the lots. The reports generated from these analyses are contained in Appendix 2. The cumulative results are presented in Table 2.

B. Test Atmosphere Generation and Analysis of 1,2-Dichloroethane

1. Generation of test atmospheres: A separate generation system was maintained for each of the three test chambers. The systems consisted of gas wash bottles having a coarse glass frit on the inlet tube located approximately 1/8 in. from the bottom of the wash bottle. Compressed air entering through the bottom of the gas wash bottle was allowed to bubble through the glass frit and through the EDC to generate EDC vapors. These vapors were transferred to a secondary dilution flask, where they were further diluted by air. The final vapors produced in the secondary dilution flask were transferred to the intakes of the test chambers via 1/4-in. Teflon lines, where they were diluted to the desired test concentration. The systems were operated at ambient temperatures to minimize degradation of test chemical.

Each generation system was contained within an isolation box (23 in. x 12 in. x 30 in.), specially designed for operation under negative pressure. Each box was vented into a charcoal-filtered exhaust system. The fronts of the isolation boxes were constructed from 3/8-in. lucite, reinforced with 1/2-in. aluminum rods. Operations for weighing and filling the gas washing bottles were conducted in a Class A hood in a laboratory adjacent to the inhalation chambers.

The concentrated mixtures of 1,2-dichloroethane vapors were generated by metering, via flow meters, dry compressed air through the liquid 1,2-dichloroethane in the gas wash bottles. The EDC vapors were then transferred, via 1/8-in. Teflon lines, to the secondary dilution flasks, where they were further diluted with compressed air, mixed, and then channeled to the appropriate intake port of the test chambers. Chamber-intake air was then used to dilute the vapors to the desired test concentration. The secondary dilution flasks also served as safety flasks for containing any possible spillover of liquid 1,2-dichloroethane from the gas wash bottles.

TABLE 2

CUMULATIVE REANALYSIS RESULTS OF DISULFIRAM

Reanalysis Date	Purity Analysis by High Performance Liquid Chromatography (% of Reference Sample)
9/1/82 Lot No. S062982 (Original Analysis)	-
1/17/83 Lot No. S062982	100.6 ± 0.2(s)%
5/10/83 Lot No. S062982	100.0 ± 0.4(s)%
8/30/83 Lot No. S062982	99.5 ± 0.7(s)%
1/9/84 Lot No. S062982	100.2 ± 0.3(s)%
10/7/83 Lot No. 89C0022 (Original Analysis)	-
5/4/84 Lot No. 89C0022	100.8 ± 0.9(s)%
9/19/84 Lot No. 89C0022	100.0 ± 0.1(s)%

2. Analyses for concentration of chemical in the test atmospheres: A description of the monitoring system and methods for its standardization and use are given below.

a. Monitoring system: The system used for monitoring 1,2-dichloroethane concentrations in the test atmospheres consisted of an automatic gas sampling system, designed and built by MRI, coupled to a gas chromatographic system equipped with a flame ionization detector. The components of this system are described in detail below.

(1) Automatic sampling system: Samples from the test atmospheres were withdrawn, via vacuum pump, from the chambers. A series of valves controlled by a hard-wired program directed the samples either to the gas chromatographic system or to exhaust as described below. Flow diagrams for this system are given in Figures 1 and 2.

Each of the lines coming from the chamber room (one line/chamber) was connected to a three-way solenoid-activated Teflon valve. These valves were normally in the open position, directing sample flow through a manifold to the system exhaust.

When one of these valves was activated (closed), either by manual selection of an incoming line or by the timing mechanism in automatic operation, the sample in that line was shunted to another manifold that led to the gas chromatograph. This valve directed the sample stream into one of the matched, zero-dead-volume, 1.0-cc sampling loops. When an equilibration and injection sequence was initiated, a solenoid-controlled Teflon valve on the downstream side of the sampling valve and the line valve in the autosampler both closed. The sample was then allowed to equilibrate thermally in the closed loop. After a set interval of time, a motor rotated the sampling valve, injecting the sample onto the column by connecting the sample loop to the carrier gas line of the gas chromatograph.

The rotation of the sample valve simultaneously directed sample from the next chamber to be monitored through the second sampling loop. Sample continued to flow through this loop until it was equilibrated and injected according to the same sequence.

(2) Gas chromatographic system

Instrument: Varian 2400 gas chromatograph
Detector: Flame ionization
Column: 10% Carbowax 20M-TPA on 80/100 Chromosorb W(AW), 1.8 m x 2 mm ID; nickel
Carrier Gas: Nitrogen
Carrier Gas Flow Rate: 30 cc/min
Inlet Temperature: 150°C
Detector Temperature: 250°C
Column Oven Temperature: 70°C
Data Handling: Varian CDS 111 Integrator

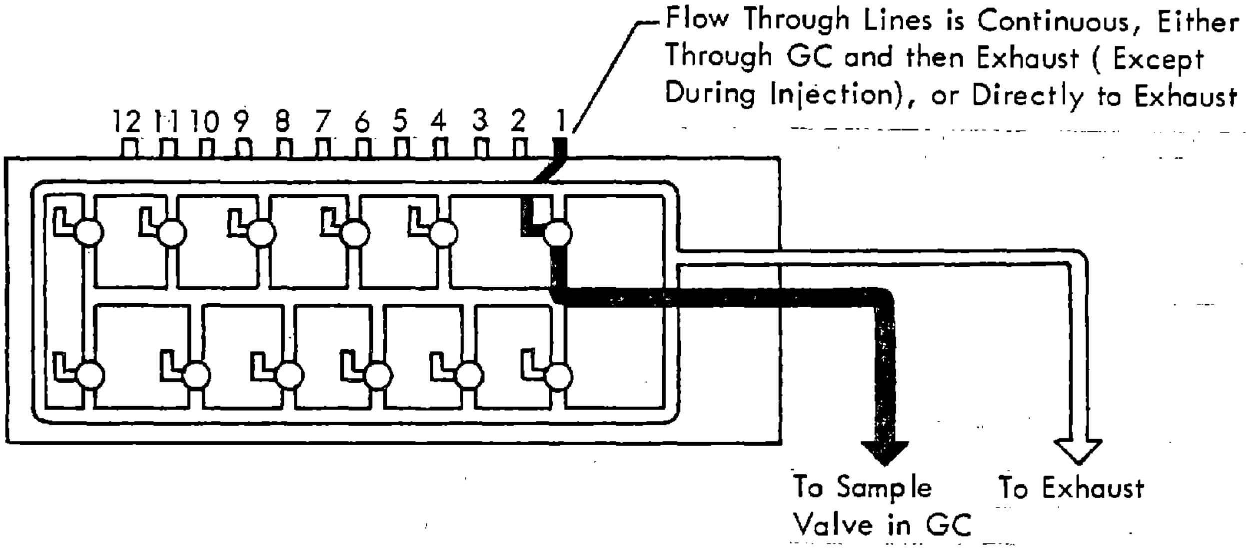

Figure 1 - Flow Diagram Through Autosampler

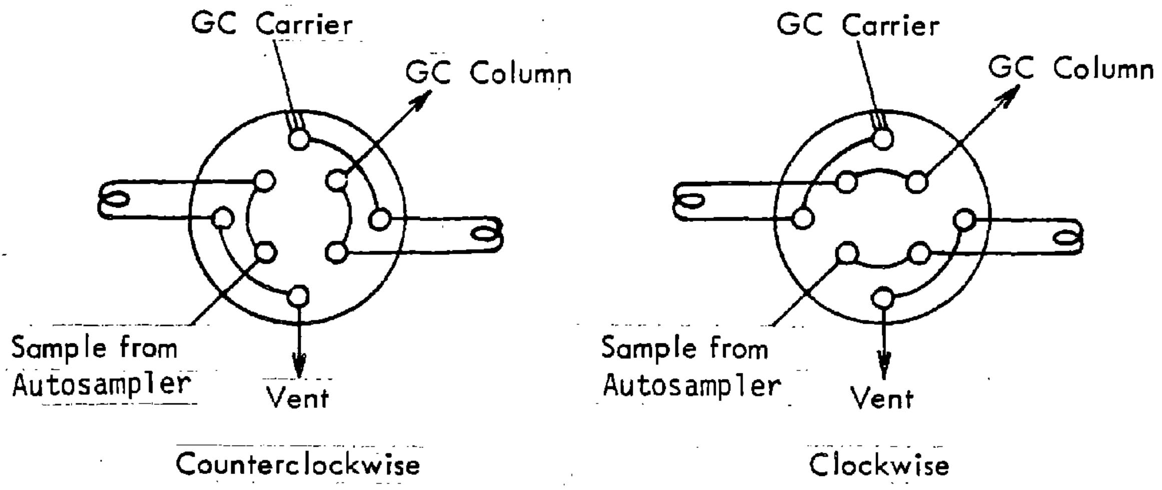

Figure 2 - Three-way Sample Valve in Gas Chromatograph
Left: Sample entry; Right: Transfer to column

b. System standardization: Manual injection of accurately prepared solutions of 1,2-dichloroethane in n-hexane was used for standardization of the gas chromatographic system. A complete standardization was performed on a daily basis, prior to initiation of the 7-hr exposure period. At least one of the standards was reinjected after the daily exposure to verify that the system had not changed during the exposure. Standards were prepared on a weekly basis and aliquots were transferred to multiple septum vials. The vials were stored at -20°C until used. Any single vial was used for 1 day's exposure and discarded after daily use.

c. Monitoring frequency: During the study, samples from each test chamber atmosphere and a sample of air from the two work rooms were analyzed every 30 min.

d. Quality control samples: During the study, one blind sample was supplied to the chamber monitoring technician each month. This sample, containing 1,2-dichloroethane at a concentration unknown to the technician, was analyzed and the results reported to the project chemist. The purpose of these samples was to check the accuracy of the instrument operators and of the instrumental system itself.

The values obtained were found to be in good agreement with theoretical values. The average for 22 samples was found to be 99.0 ± 4.0(s)% and ranged from 90.4 to 108.5% of theoretical values.

Reports detailing the results of these analyses were issued at 6-month intervals. The final report, giving the cumulative results for these analyses, is contained in Appendix 4.

e. Data handling and interpretation: Data output from the monitoring was in the form of direct chamber concentration readings (ppm). These data were recorded on forms provided for that purpose and were subsequently entered into a computer program which calculated daily and monthly means, standard deviations, and listed individual maximum and minimum readings. These forms were maintained as a permanent record, together with integrator tapes and strip charts. All data generated were evaluated by the project chemist.

f. Tabulation of chamber concentrations: The 1,2-dichloroethane concentrations in the test atmospheres are contained in Appendix 5. The concentrations were tabulated on a daily, weekly, and monthly basis. In addition, the percent number of outliers with respect to the total number of exposure days (daily exposure levels which were greater than or less than 10% of the target level) for the entire chronic study were 4.8%, 5.1%, and 5.9% for the EDC, EDC/DS, and the EDC/ET chamber groups, respectively. Daily chamber averages of EDC which exceeded the ± 10% target level were the result of technical or analytical equipment variability. The information is summarized in Table 3.

TABLE 3

NUMBER OF PERIODS FOR EACH EXPOSURE GROUP IN WHICH THE DAILY AVERAGE EXPOSURE OF EDC WAS GREATER THAN OR LESS THAN 10% OF THE TARGET CONCENTRATION OF 50 ppm

	Number of Outliers				Total No. Outliers / Total Exposure Days	
Group	> 10%	< 10%	> 20%	< 20%		%
EDC	12	9	2	1	24/495	4.8
EDC/DS	14	9	2	0	25/495	5.1
EDC/ET	19	8	2	0	29/495	5.9

3. Special studies

a. Validation of automatic sampling system: This study was performed to validate the use of the autosampling system used during this study. Full details of this analysis are contained in Appendix 4.

Using a 1.0-cc gas-tight syringe, triplicate grab samples of EDC chamber atmosphere were removed from an equilibrated inhalation chamber and analyzed for EDC concentration. Similarly, triplicate samples of EDC chamber atmosphere from the same inhalation chamber were analyzed for EDC concentration using the automatic sampling system. All of the samples were analyzed using the same gas chromatographic system as that used routinely to monitor EDC chamber concentrations. To obtain a representative sample and minimize the differences in chamber atmosphere concentration, the samples were analyzed by alternating between a grab sample and an autosampler sample until triplicate determinations using each sampling method were obtained.

The results obtained using the automatic sampling system were found to be 97.6 ± 2.4(s)% of those obtained from manual injections of chamber atmosphere. These results validate the use of the automatic sampling system for this study.

b. Correction of EDC chamber concentration data for average calibration factor differences: The purpose of this work was to correct the EDC chamber concentration data for differences in the average calibration factor used by the Varian CDS-111 integrator. Full details of this analysis are contained in Appendix 4.

Prior to the start of each 7-hr exposure, liquid standards containing known amounts of EDC in hexane are injected into the gas chromatographic monitoring system. A calibration factor (Cal Fact), based on an external standard calculation, is generated by the Varian CDS-111 integrator for each of the liquid standards injected. The average of these values is then placed in a line program of the integrator which calculates actual EDC chamber concentrations in parts per million (ppm).

On certain days, Cal Fact values were not used to calculate the average Cal Fact value. Since a statistical procedure was not used for rejection, the standardization data were evaluated using the Tietjen-Moore equation for determining statistical outliers occurring on one or both sides of the mean. If Cal Fact values were determined to be outliers, these values were rejected and a new average Cal Fact value was calculated. Each chamber concentration reading obtained during the exposure period was then recalculated using this new value.

Review of the morning standardization data indicated 76 days that EDC chamber concentration data needed to be corrected. All of these days fell between 12/27/82 and 10/3/83. Since there were 495 exposure days for each chamber, the overall effect of these corrections on this study mean was minimal.

c. Stability of ethanolic drinking water in the water delivery system: This study was performed to determine if the ethanol concentration was altered by the water delivery system. Full details of this analysis are contained in Appendix 4.

A sample of ethanolic drinking water, which had been in the water delivery system for 2 weeks, was removed from a sipper tube. The same gas chromatographic method employed for the original analysis was used to analyze the sample for ethanol concentration and the results compared with the concentration obtained during the original analysis.

The results obtained from this analysis indicated that ethanolic drinking water was stable in the water delivery system for a period of 2 weeks.

d. Dräger validation method and chamber ammonia sampling: This study was performed to validate the use of the Dräger method for measuring ammonia concentrations in inhalation test atmospheres. Full details of this analysis are contained in Appendix 4.

Atmospheres of known ammonia concentration were prepared in gas sampling bags by adding accurately measured amounts of aqueous ammonium hydroxide (29%) to known volumes of room air and to control chamber atmosphere. After allowing sufficient time to ensure total evaporation of the ammonium hydroxide, those standards were analyzed using the Dräger method.

Both the standards prepared with the room air and the standards prepared with control chamber atmosphere yielded linear relationships with parallel slopes and correlation coefficients of 0.994 and 0.995, respectively. This study demonstrated that ammonia levels were being accurately measured, within the limits of error (± 15%) of the method.

When samples were obtained from a control chamber under the heaviest animal activity level (early morning prior to chamber waste pan removal), the ammonia concentration was $\leqq$ 8 ppm. Later ammonia readings (6 hr after waste pan removal) were $\leqq$ 1 ppm.

e. Analysis of disulfiram/feed mix stored under actual conditions: This analysis was performed to determine whether dosed feed blends remain stable under actual bioassay storage conditions. Full details of this analysis are contained in Appendix 4.

A sample containing dosed feed (Lot No. 20), which had been stored in a plastic bag in a freezer at -20°C, was analyzed for disulfiram according to standardized procedures. The results of the analysis were compared with the results from the original analysis on Lot No. 20 to determine if the sample remained stable under the actual storage conditions.

The results obtained indicated that dosed feed blends stored approximately 1 month under conditions used in this study retained > 97% of their original disulfiram dose concentration.

f. Chamber distribution studies: The purpose of the chamber distribution studies was to validate the use of single port sampling for daily concentration monitoring. This was done by demonstrating that the 1,2-dichloroethane concentrations at ports adjacent to the cage units were similar to that of the port from which samples were removed for daily concentration monitoring. Samples were taken for analysis with the probes placed directly above each cage unit in the chamber (12 locations). Chamber atmosphere concentrations were measured using the previously described daily concentration monitoring system.

The coefficient of variation between the concentration at the different locations was found to be less than 6% using this procedure. See Appendix 4 for distribution study reports for each chamber.

C. Disulfiram/Feed Mix Preparation and Analysis

1. Preparation of 0.05% disulfiram/feed mix: The following procedures were followed during the feed mix preparation.

a. Three 10-kg amounts of Purina 5002 rodent chow were weighed into three separate containers.

b. A 200-mL beaker was tared on a balance and disulfiram ladeled into the beaker until 15.0 g of disulfiram had been weighed. The beaker was then covered with Parafilm.

c. Approximately 8 g of the weighed disulfiram was poured into a mortar, along with an equal amount of the previously weighed feed. The feed and disulfiram were mixed until a uniform mixture was obtained. The remainder of the disulfiram was then added to the mixture. Approximately 24 g of feed was added to the 200-mL beaker and stirred to pick up the residual disulfiram. This was then added to the premix contained in the mortar. The mixture was then stirred until it was determined to be uniform in texture and color.

d. The premix from step c was then transferred to a mixing bowl along with 100 g of feed. The contents were then stirred and mixed as before. Another 200 g of feed was added to the bowl and the mixing process continued.

e. To a previously clean and inspected PK blender, one bucket (10 kg) of the weighed feed was added to each of the two upper ports.

f. Approximately one-half of the premix was added to each of the two upper ports. Approximately 200 g of feed from the last bucket was added to the mixing bowl to pick up any residual disulfiram. The contents of the bowl were then added to the blender along with the remaining feed in the final bucket.

g. The blender was secured and mixed for 35 min with the intensifier bar turned on shortly after the start of the mixing period.

h. At the end of the mixing period, a plastic bag was placed around the opening of the lower port and half the contents of the blender allowed to flow into the bag. The feed remaining was placed in a second plastic bag. The blender was tapped with a rubber mallet to shake loose all of the feed.

i. A 4-oz jar was filled with the dosed feed and the dosed feed labeled with the appropriate lot number, project number, date prepared, etc. The plastic bags containing the dosed rat feed were stored in a freezer at -20°C.

2. Analyses of 0.05% disulfiram/feed mix: Samples from each lot number of dosed feed, contained in 4-oz screw top jars, were shipped to MRI's Volker facility and analyzed under the supervision of the project chemist to determine the actual concentration of disulfiram in the feed. The analytical method employed was a determination of concentration by high performance liquid chromatography. Methodologies for this analysis are given below.

a. Triplicate 10.0-g samples of dosed feed from each lot number were shaken on a wrist-action shaker with 100 mL of acetonitrile for 30 min to extract the chemical.

b. Three individually spiked portions of feed, dosed at the same concentration as the samples, were prepared to determine the recovery of disulfiram from feed.

c. The extracts were clarified by centrifugation, and a 10-mL aliquot of extract along with a 3-mL aliquot of internal standard solution [butyrophenone, 0.75 mg/mL in methanol:water (75:25)] were diluted to 25 mL with methanol:water (75:25).

d. The final solutions were filtered through an 0.45-μ filter and injected in duplicate into the high performance liquid chromatography system below.

Pump: Waters Model 6000
Injector: Waters 710B Autoinjector
Detector: Waters 440 Wavelength: 280 nm
Attenuation: 0.10 AUFS
Column: Waters Z-Module radial compression column with μ Bondapack C18 cartridge (115 mm x 8 mm ID)
Mobile Phase: Methanol:water (75:25)
Flow Rate: 3.0 mL/min
Injection Volume: 20 μL
Data System: Nelson 4400 Data System

e. Detector response was monitored by injecting a matrix standard, disulfiram dissolved in extracted undosed feed solution (20 μg/mL), after every third sample. The accuracy of the calibration standard was verified by chromatographing another independently prepared matrix standard.

f. The areas of the disulfiram and internal standard peaks were integrated by a Nelson 4400 data system. A RRF (relative response factor) was calculated for each injection of the matrix standard. The RRF was calculated as follows:

RRF = Disulfiram Std Conc x Peak Area of Internal Std ÷ Peak Area of Disulfiram

g. The concentration of disulfiram found in each feed sample (in mg/g) was then calculated using the following equation:

RRF x Peak Area of Disulfiram x D.F. ÷ Peak Area of Internal Std ÷ 10.0 (grams of sample)

where D.F. = dilution factor = 250

h. If the mean recovery of disulfiram from the spiked feed samples were < 99%, the sample results were appropriately corrected.

A final report was issued to the principal investigator prior to the use of the dosed feed. Copies of these reports are contained in Appendix 3. The cumulative results from these analyses are presented in Table 4.

D. 5% Ethanolic Drinking Water Preparation and Analysis

1. Preparation of 5% ethanolic drinking water: The following procedures were followed during the preparation of the ethanol/water mix.

a. The 55-gal. drum to be used as the mixing container was disinfected by rinsing with ethanol followed by filtered water.

b. Using a 1-L graduated cylinder, 11,579 mL of 95% ethanol was added to the drum. Filtered water was then added until the final volume just reached the bung holes of the drum.

c. Using a long-shaft stainless steel stirring paddle, the contents of the drum were mixed for approximately 5 min.

d. A 10- to 20-mL sample was then collected in a glass vial for analysis.

TABLE 4

CUMULATIVE RESULTS OF % DISULFIRAM FOUND IN RODENT FEED

(Target Label Concentration = 0.05%)

Mixing Date	Lot No.	Disulfiram Found (%)	Percent Of Label
9/21/82	1	0.0512 ± 0.0008(s)	102.5 ± 1.5(s)
9/29/82	1	0.0496 ± 0.0001(s)	99.2 ± 0.3(s)
	2	0.0492 ± 0.0001(s)	98.6 ± 0.2(s)
10/6/82	1	0.0508 ± 0.0004(s)	101.5 ± 0.7(s)
	2	0.0504 ± 0.0001(s)	100.9 ± 0.1(s)
	3	0.0492 ± 0.0006(s)	98.5 ± 1.3(s)
	4	0.0508 ± 0.0002(s)	101.7 ± 0.5(s)
10/27/82	1	0.0516 ± 0.0007(s)	103.2 ± 1.4(s)
	2	0.0514 ± 0.0005(s)	102.7 ± 1.0(s)
	3	0.0514 ± 0.0004(s)	102.7 ± 1.0(s)
	4	0.0522 ± 0.0008(s)	104.3 ± 1.6(s)
11/18/82	1	0.0517 ± 0.0001(s)	103.4 ± 0.3(s)
	2	0.0516 ± 0.0011(s)	103.2 ± 2.3(s)
	3	0.0534 ± 0.0009(s)	106.7 ± 1.8(s)
	4	0.0528 ± 0.0015(s)	105.5 ± 3.1(s)
12/16/82	1	0.0506 ± 0.0009(s)	100.1 ± 1.8(s)
	2	0.0498 ± 0.0008(s)	99.6 ± 1.7(s)
	3	0.0494 ± 0.0002(s)	98.9 ± 0.4(s)
	4	0.0504 ± 0.0001(s)	100.8 ± 0.3(s)
1/5/83	1	0.0484 ± 0.0005(s)	96.9 ± 1.0(s)
	2	0.0488 ± 0.0001(s)	97.5 ± 0.1(s)
	3	0.0476 ± 0.0000(s)	95.2 ± 0.0(s)
	4	0.0474 ± 0.0006(s)	94.9 ± 1.3(s)
2/2/83	1	0.0490 ± 0.0009(s)	97.9 ± 1.8(s)
	2	0.0477 ± 0.0001(s)	95.4 ± 0.3(s)
	3	0.0488 ± 0.0003(s)	97.6 ± 0.6(s)
	4	0.0488 ± 0.0002(s)	97.7 ± 0.4(s)
2/25/83	1	0.0514 ± 0.0008(s)	102.9 ± 1.6(s)
	2	0.0489 ± 0.0007(s)	97.8 ± 1.4(s)
	3	0.0490 ± 0.0002(s)	97.9 ± 0.4(s)
	4	0.0494 ± 0.0001(s)	98.7 ± 0.1(s)

TABLE 4 (continued)

Mixing Date	Lot No.	Disulfiram Found (%)	Percent Of Label
3/22/83	1	0.0497 ± 0.0001(s)	99.4 ± 0.3(s)
	2	0.0465 ± 0.0001(s)	93.0 ± 0.3(s)
	3	0.0470 ± 0.0002(s)	93.9 ± 0.4(s)
	4	0.0472 ± 0.0001(s)	94.3 ± 0.1(s)
4/18/83	1	0.0480 ± 0.0006(s)	96.0 ± 1.1(s)
	2	0.0472 ± 0.0001(s)	94.4 ± 0.8(s)
	3	0.0487 ± 0.0003(s)	95.6 ± 0.6(s)
	4	0.0501 ± 0.0007(s)	100.0 ± 1.7(s)
5/5/83	1	0.0485 ± 0.0001(s)	97.0 ± 0.03(s)
	2	0.0476 ± 0.0006(s)	95.3 ± 1.3(s)
	3	0.0475 ± 0.0001(s)	94.9 ± 0.1(s)
	4	0.0488 ± 0.0006(s)	97.6 ± 1.1(s)
6/2/83	1	0.0478 ± 0.0005(s)	95.7 ± 0.9(s)
6/14/83	1	0.0528 ± 0.0001(s)	105.6 ± 2.3(s)
6/15/83	2	0.0481 ± 0.0001(s)	96.2 ± 2.0(s)
	3	0.0516 ± 0.0004(s)	103.1 ± 0.7(s)
	4	0.0520 ± 0.0003(s)	104.0 ± 0.6(s)
6/29/83	1	0.0494 ± 0.0004(s)	98.7 ± 0.4(s)
	2	0.0485 ± 0.0004(s)	97.0 ± 0.8(s)
	3	0.0494 ± 0.0000(s)	98.8 ± 0.0(s)
	4	0.0489 ± 0.0007(s)	97.8 ± 1.4(s)
7/27/83	5	0.0488 ± 0.0004(s)	97.6 ± 0.8(s)
	6	0.0484 ± 0.0004(s)	96.9 ± 0.7(s)
	7	0.0484 ± 0.0004(s)	96.9 ± 0.7(s)
	8	0.0488 ± 0.0002(s)	97.5 ± 0.4(s)
8/17/83	9	0.0491 ± 0.0007(s)	98.2 ± 1.4(s)
	10	0.0494 ± 0.0008(s)	98.8 ± 1.7(s)
	11	0.0494 ± 0.0005(s)	98.8 ± 1.0(s)
	12	0.0493 ± 0.0004(s)	98.6 ± 0.8(s)
9/7/83	13	0.0471 ± 0.0005(s)	94.2 ± 1.0(s)
	14	0.0474 ± 0.0006(s)	94.8 ± 1.3(s)
	15	0.0484 ± 0.0005(s)	96.8 ± 1.0(s)
	16	0.0472 ± 0.0001(s)	94.4 ± 0.3(s)

TABLE 4 (continued)

Mixing Date	Lot No.	Disulfiram Found (%)	Percent Of Label
9/28/83	17	0.0492 ± 0.0004(s)	98.4 ± 0.8(s)
	18	0.0498 ± 0.0002(s)	99.5 ± 0.4(s)
	19	0.0502 ± 0.0001(s)	100.4 ± 0.1(s)
	20	0.0498 ± 0.0001(s)	99.6 ± 0.1(s)
10/25/83	21	0.0484 ± 0.0005(s)	96.9 ± 1.0(s)
	22	0.0486 ± 0.0001(s)	97.2 ± 0.2(s)
	23	0.0495 ± 0.0003(s)	99.0 ± 0.6(s)
	24	0.0477 ± 0.0007(s)	95.4 ± 1.4(s)
11/17/83	25	0.0476 ± 0.0001(s)	95.2 ± 0.2(s)
	26	0.0482 ± 0.0008(s)	96.4 ± 1.6(s)
	27	0.0480 ± 0.0001(s)	96.0 ± 0.2(s)
	28	0.0486 ± 0.0002(s)	97.2 ± 0.4(s)
12/8/83	29	0.0494 ± 0.0007(s)	98.8 ± 1.4(s)
	30	0.0478 ± 0.0017(s)	95.7 ± 3.5(s)
	31	0.0489 ± 0.0002(s)	99.6 ± 0.4(s)
12/30/83	32	0.0494 ± 0.0004(s)	98.8 ± 0.8(s)
	33	0.0494 ± 0.0001(s)	98.8 ± 0.2(s)
	34	0.0499 ± 0.0006(s)	99.8 ± 1.2(s)
	35	0.0501 ± 0.0001(s)	100.2 ± 0.2(s)
1/23/84	36	0.0497 ± 0.0000(s)	99.4 ± 0.0(s)
	37	0.0500 ± 0.0000(s)	100.0 ± 0.0(s)
	38	0.0506 ± 0.0004(s)	101.2 ± 0.8(s)
	39	0.0508 ± 0.0001(s)	101.6 ± 0.2(s)
2/13/84	40	0.0484 ± 0.0001(s)	96.8 ± 0.3(s)
	41	0.0480 ± 0.0007(s)	96.0 ± 1.4(s)
	42	0.0491 ± 0.0004(s)	98.2 ± 0.8(s)
	43	0.0489 ± 0.0003(s)	97.8 ± 0.6(s)
3/8/84	44	0.0496 ± 0.0004(s)	99.2 ± 0.7(s)
	45	0.0496 ± 0.0006(s)	99.2 ± 1.2(s)
	46	0.0496 ± 0.0006(s)	99.2 ± 1.2(s)
	47	0.0494 ± 0.0006(s)	98.8 ± 1.2(s)
4/5/84	48	0.0488 ± 0.0008(s)	97.6 ± 1.5(s)
	49	0.0492 ± 0.0006(s)	98.4 ± 1.2(s)
	50	0.0485 ± 0.0002(s)	97.0 ± 0.3(s)
	51	0.0490 ± 0.0006(s)	98.0 ± 1.2(s)

TABLE 4 (concluded)

Mixing Date	Lot No.	Disulfiram Found (%)	Percent Of Label
5/10/84	52	0.0500 ± 0.0002(s)	100.0 ± 0.4(s)
	53	0.0501 ± 0.0005(s)	100.2 ± 1.0(s)
	54	0.0482 ± 0.0006(s)	96.4 ± 0.1(s)
	55	0.0483 ± 0.0002(s)	96.6 ± 0.4(s)
6/7/84	56	0.0503 ± 0.0004(s)	100.6 ± 0.8(s)
	57	0.0500 ± 0.0004(s)	100.0 ± 0.8(s)
	58	0.0502 ± 0.0007(s)	100.4 ± 1.4(s)
	59	0.0502 ± 0.0006(s)	100.4 ± 1.2(s)
7/11/84	60	0.0484 ± 0.0008(s)	96.8 ± 1.6(s)
	61	0.0477 ± 0.0002(s)	95.4 ± 0.4(s)
	62	0.0467 ± 0.0002(s)	93.4 ± 0.4(s)
	63	0.0488 ± 0.0005(s)	97.6 ± 1.0(s)
8/9/84	64	0.0491 ± 0.0012(s)	98.2 ± 2.4(s)
	65	0.0481 ± 0.0020(s)	96.2 ± 4.0(s)
	66*	0.0427 ± 0.0007(s)	85.4 ± 1.7(s)
	67	0.0499 ± 0.0015(s)	99.8 ± 3.0(s)

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* This lot of disulfiram/feed mix was not within the specifications required for use on this program (0.05 ± 0.005%); however, Lot No. 66 was not needed or used in this program.

2. Analysis of 5% ethanolic drinking water mix: A sample of the ethanolic drinking water was analyzed by Deramus Field Station personnel to determine the actual concentration of ethanol present in the sample. The concentration was determined by gas chromatography. Methodologies for this analysis are given below.

a. Prior to the analysis of the ethanol/water sample, standards containing 3.8 and 5.7% v/v ethanol in water were prepared according to standardized procedures.

b. Duplicate injections from each of the two standards and triplicate injections of the ethanol/water sample were made into the gas chromatography system described below.

Instrument: Varian 920 gas chromatograph
Detector: Thermal conductivity
Column: 100/120 mesh Chromosorb 105; 3.0 m x 2 mm ID; nickel
Carrier Gas: Helium
Carrier Gas Flow Rate: 30 cc/min
Reference Cell Flow Rate: 30 cc/min
Inlet Temperature: 250°C
Detector Temperature: 250°C
Column Oven Temperature: 170°C, isothermal
Filament Current: 150 mA

c. The areas of all the ethanol peaks were calculated using the following equation:

$$A = H \times W1/2$$

where: A = Area of the peak (in mm^2)
H = Height of the peak (in mm)
W1/2 = Width of the peak (in mm) measured at the peak's half-height (H/2)

d. Response: The standard values (%/A Std) for each of the standard ethanol peaks were calculated using the % ethanol value (3.8 or 5.7%) of the standard injected and the (A) obtained in step c above.

e. The mean ($\overline{\%/A}$ Std), standard deviation, and the coefficient of variation for all of the %/A Std values obtained were calculated.

f. The percent ethanol in the ethanol/water sample was calculated for each of the three injections using the following equation:

$$\text{EtOH\% (v/v)} = (\overline{\%/A}\ \text{Std}) \times (\text{A sample})$$

where: $\overline{\%/A}$ Std = Mean of %/A Std values obtained in step d above.
A sample = Area of sample peak (in mm^2)

g. The mean, standard deviation, and coefficient of variation for the EtOH% (v/v) value were calculated. The maximum allowable coefficient of variation was ≦ 5%.

A record of each analysis, including a fully documented strip chart, along with a copy of the calculations, was maintained as a permanent record of the analysis. The cumulative results from all the analyses are presented in Table 5.

E. Animals Used in Chronic Study

For species, strain of animal, source of animals (supplier, city, state), examinations to assure health of test animals, quarantine period, assignment to test group, age, weight when received, age and weight when placed on test, and randomization procedure, see Table 6.

F. Animal Maintenance

The animals were housed individually in stainless steel cage modules (Hazelton Systems, Inc., P.O. Box 700, Aberdeen, Maryland) one per compartment. The design of the cages allowed for the housing of animals in individual compartments within the cage modules; each cage module contained 16 male and/or female rats, or 24 female rats, depending upon the design of the cage module (Figure 3). Each cage was equipped with an automatic watering system (glass water bottles were used overnight for determining water consumption data), and removable glass jar feeders. Cage modules were housed in 2.2-m^3 Hazelton-1000 chambers (one chamber per dose group), located in Rooms 2 and 3 (control, DS, and ET dose groups in Room 2, EDC, EDC/DS, and EDC/ET dose groups in Room 3), Building 5, MRI, Deramus Field Station, 13110 Robinson Pike Road, Grandview, Missouri 64030.

Cages were rotated within each inhalation chamber one position counterclockwise weekly throughout the study.

The cages and feeders were changed once a week and washed in a Girton Tunnel Washer (Girton Manufacturing Company, Millville, Pennsylvania 17846) in which a 180°F water temperature was maintained. Clout® detergent was used in the washing cycles (Pharmacal Research Laboratory, Greenwich, Connecticut 06830). The water bottles, used only overnight for collecting water consumption data, were removed, washed, and autoclaved after every use. The wastepans were changed and washed daily. DACB® (Deotized Animal Cage Board, supplied by Shepherd Speciality Papers, Inc., P.O. Box 804, Kalamazoo, Michigan 49005), used only during the weekends and holidays, was changed daily.

Daily room sanitation consisted of rinsing the floor with water and forcing the water to drains with floor squeegees.

TABLE 5

CUMULATIVE RESULTS OF ETHANOL IN DRINKING WATER

(Target Concentration = 5%)

Mixing Date	Analytical Results	Found/Target (%)
9/23/82	5.60 ± 0.28(s)%	112.0
10/4/82	4.30 ± 0.13(s)%	86.0
10/11/82	5.49 ± 0.58(s)%	109.8
10/13/82	4.90 ± 0.78(s)%	98.0
10/18/82	4.89 ± 0.09(s)%	97.8
10/20/82	4.71 ± 0.50(s)%	94.2
10/21/82	5.08 ± 0.20(s)%	101.6
11/2/82	4.95 ± 0.26(s)%	99.0
11/2/82	4.88 ± 0.36(s)%	97.6
11/10/82	5.42 ± 0.36(s)%	108.4
11/12/82	4.98 ± 0.07(s)%	99.6
11/23/82	4.65 ± 0.04(s)%	93.0
12/9/82	5.10 ± 0.09(s)%	102.0
12/27/82	4.68 ± 0.21(s)%	93.6
1/7/83	4.85 ± 0.15(s)%	97.0
1/21/83	4.76 ± 0.07(s)%	95.2
2/3/83	5.54 ± 0.48(s)%	110.8
2/22/83	5.44 ± 0.06(s)%	108.8
3/11/83	5.09 ± 0.08(s)%	101.8
3/23/83	5.50 ± 0.27(s)%	110.0
4/6/83	4.96 ± 0.15(s)%	99.2
4/20/83	5.15 ± 0.32(s)%	103.0
5/5/83	4.62 ± 0.17(s)%	92.4
5/16/83	5.10 ± 0.22(s)%	102.0
6/1/83	5.10 ± 0.30(s)%	102.0
6/17/83	5.01 ± 0.21(s)%	100.2
7/1/83	5.14 ± 0.06(s)%	102.8
7/17/83	5.18 ± 0.05(s)%	103.6
8/1/83	5.08 ± 0.02(s)%	101.6
8/11/83	5.06 ± 0.06(s)%	101.2
8/25/83	5.01 ± 0.10(s)%	100.2
9/9/83	4.94 ± 0.21(s)%	98.8
9/27/83	5.11 ± 0.10(s)%	102.2
10/11/83	4.99 ± 0.14(s)%	99.8
10/24/83	5.23 ± 0.16(s)%	104.6
11/7/83	5.12 ± 0.23(s)%	102.4
11/21/83	5.08 ± 0.00(s)%	101.6
12/6/83	5.39 ± 0.32(s)%	107.8
12/20/83	5.15 ± 0.04(s)%	103.0
1/5/84	4.92 ± 0.14(s)%	98.4
1/24/84	5.06 ± 0.07(s)%	101.2
2/7/84	5.08 ± 0.07(s)%	101.6

TABLE 5 (concluded)

Mixing Date	Analytical Results	Found/Target (%)
2/23/84	5.08 ± 0.05(s)%	101.6
3/12/84	5.13 ± 0.07(S)%	102.6
3/28/84	5.23 ± 0.05(s)%	104.6
4/18/84	5.29 ± 0.24(s)%	105.8
5/1/84	5.12 ± 0.07(s)%	102.4
5/16/84	5.49 ± 0.08(s)%	109.8
6/5/84	5.44 ± 0.16(s)%	108.8
6/28/84	5.06 ± 0.39(s)%	101.1
7/18/84	4.99 ± 0.25(s)%	99.8
7/31/84	5.22 ± 0.58(s)%	104.4
8/21/84	4.82 ± 0.22(s)%	96.4

TABLE 6

EXPERIMENTAL DESIGN AND MATERIAL AND METHODS FOR STUDIES OF SPRAGUE-DAWLEY RATS INHALING 1,2-DICHLOROETHANE

EXPERIMENTAL DESIGN:

Size of Test Groups: 50 males and 50 females

	Group No. (Designation)	Parameters EDC	Diet	Water
Doses:	1 (Control)	Filtered air	Standard diet	Drinking water
	2 (DS)	Filtered air	0.05% disulfiram	Drinking water
	3 (ET)	Filtered air	Standard diet	5% ethanol
	4 (EDC/DS)	50 ppm	0.05% disulfiram	Drinking water
	5 (EDC)	50 ppm	Standard diet	Drinking water
	6 (EDC/ET)	50 ppm	Standard diet	5% ethanol

Duration of Dosing:

- 103 Weeks (exclusive of weekends and holidays) for 50 ppm 1,2-dichloroethane dose groups.
- 104 Weeks (exclusive of weekends and holidays) for 5% ethanol and 0.05% disulfiram dose groups. Note: special study animals* continued to 105 weeks. Termination dates: 9/24/84 to 9/27/84.
- First treatment date for ethanol or disulfiram: 9/20/82
- First exposure date for 1,2-dichloroethane: 9/27/82
- Last exposure date for 1,2-dichloroethane: 9/14/84

Type and Frequency of Observation:

- Animals observed twice daily for moribundity and mortality.
- Formal observations for clinical signs of toxicity were performed each week for the first 8 weeks and monthly thereafter.
- Formal monthly palpations for tissue masses were begun 6/20/83 (week 40).
- Body weights were recorded each week for the first 8 weeks, and monthly thereafter.
- Food and water consumption data were collected each week for the first 12 weeks, every second week for the next 12 weeks, and monthly thereafter.

Necropsy and Histopathlogic Examination: All animals (600).

TABLE 6 (continued)

ANIMALS AND ANIMAL MAINTENANCE:

Species:	Sprague-Dawley CD rats.
Animal Source:	Charles River Breeding Laboratories, Kingston, NY.
Time Held Before Start of Test:	12 Days (received 9/8/82; study started 9/20/82).
Age When Placed on Study:	5-1/2 to 6 Weeks (born week of 8/12/82).
Age When Sacrificed:	110 Weeks (born 8/12/82; terminal sacrifice: 9/17/84 to 9/20/84). Special study animals:* 110 to 112 weeks (terminal sacrifice 9/24/84 to 9/27/84).
Method of Animal Distribution:	Animals of each sex randomized into dose groups via a computerized randomization stratification program.
Animal Identification:	Stainless steel ear tag (Gey Band and Tag Company, Norristown, PA).
Feed:	Purina No. 5002 Certified Rodent Chow (Ralston Purina Company, Richmond, IN 47374).
Maximum Storage Time for Feed:	120 Days post milling.
Storage Conditions for Feed:	Feed mixed with disulfiram was stored until use in a freezer at -20°C. Unmixed feed stored at room temperature.
Bedding:	Quarantine and Study Period: DACB† (Deotized Animal Cage Board) changed each morning throughout the weekend and/or holidays. Stainless steel drop pans removed and replaced with clean pans every morning throughout the week.

† DACB Specifications:

	Deotizer Layer	Backing
Composition	Chipboard	2% W.S. Kraft
Basis Wt/MSF	28 lb	20 lb
Neomycin	20-50 ppm	0
Color	Distinctive purple/blue	Brown
Moisture	5% ± .75	5% ± .75
Porosity	Not more than 10 sec	0

Supplied by: Shepherd Specialty Papers, Inc., P.O. Box 804, Kalamazoo, MI 49005

TABLE 6 (continued)

Water: (filtered)	Water was prefiltered using a 10-μm unit. Water was passed through a charcoal bed system to remove any organic materials (Model A2952, 1 cu ft, organic bed carbon exchanged every 6 months) and filtered at 1 μm to help remove bacteria greater than this size (Continental Water System, a Division of Millipore Corporation). Ethanol was mixed with filtered water and placed in pressurized carboys for delivery to appropriate test chambers. Both water and ethanol/water were supplied via an automatic watering system, Edstrom Industries, Waterford, WI, except during water consumption data collection periods when fluids were supplied in individual water bottles (placed on the cages in the afternoon following the inhalation exposure, and removed the following morning prior to initiation of the inhalation exposure.
Cages:	Hazelton Systems cage modules (See Figure 3).
Chamber Air Filtration:	HEPA/charcoal-filtered air.
Animals per Cage:	One per compartment (see Figure 3).
Chamber Environmental Conditions:	12 hr overhead fluorescent light per day. Temperature: 74 ± 4°F (70-78°F) Relative Humidity: 50 ± 15% (35-65%) Air Changes/Hour: Greater than 10
Animal Weights (g) When Received (Mean):	Males - 58.1 Females - 57.9

Animal Weights (g) When Placed on Test (Mean):	Dose Group	Male	Female
	Control	85.9	84.9
	DS	85.9	84.7
	ET	85.9	84.6
	EDC	85.8	84.6
	EDC/DS	85.9	84.9
	EDC/ET	85.9	84.6

TABLE 6 (concluded)

Animal Health Examinations:	Animals subjected to physical examination and certified to be clinically healthy by veterinarian on 9/8/82 and 9/20/82 (when animals were released from quarantine preparatory to study start up). Two animals per sex were sacrificed and necropsied for prestudy examination by veterinarian on 9/8/82. All animals were certified to be in good health.

* Special study: metabolism, distribution, and DNA binding studies were performed on animals selected from this chronic study (see separate report - Part II).

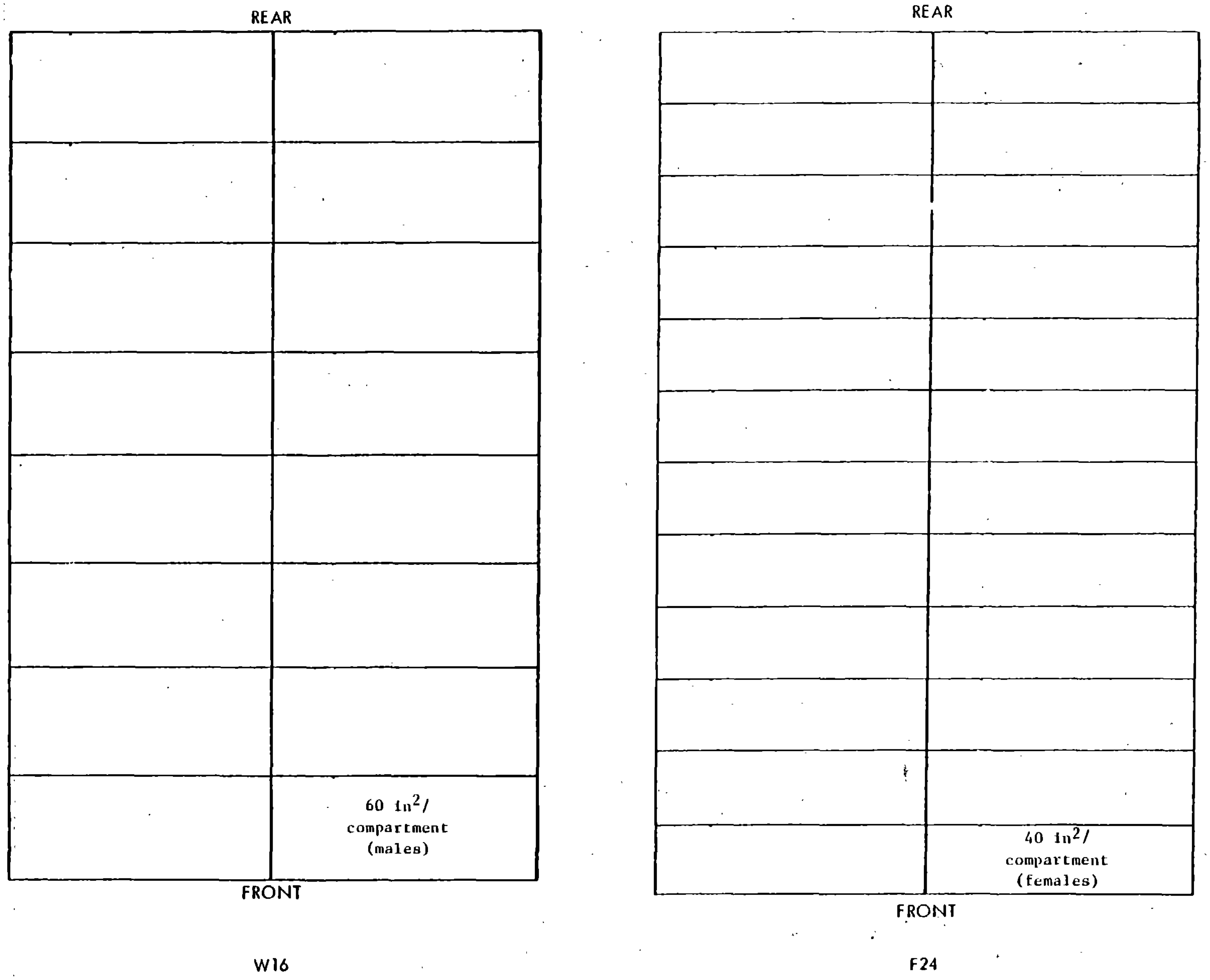

Figure 3 - Hazelton Cage Modules

The inhalation chamber water traps were flushed with water each afternoon following the chamber exposure phase. The interior surfaces were cleaned every 2 weeks with water containing Clout® and rinsed.

The halls in the animal holding quarters were washed using Clout® at least twice a week. The hall walls and doors of all the animal rooms on and off halls were washed every 3 months with Clout® and rinsed.

Roach population control was accomplished through the use of blue roach traps [Roatel (Fumakilla, Ltd.), Cornell Chemical and Equipment Company, Lithinium Height, Maryland]. Baygon 1.5 Emulsifiable Insecticide (Mobay Chemical Corporation, Kansas City, Missouri) was used only in areas where there was no possible contact with animals, animal feed, or caging. Flying insects were controlled using insect electrocutors (Blue Max, Model 601T, Don Gilbert Industries, Inc., P.O. Box 2188, 5700 Krueger Drive, Jonesboro, Arkansas 72401).

Certified Rodent Chow No. 5002 (Ralston Purina Company, Richmond, Indiana 47374) was used throughout the program. (See Appendix 6 for milling dates and sample feed label.) Each shipment of feed was rotated through the facilities approximately every 90 days and no greater than 120 days from the milling date. In addition, each rodent feed lot received a basic analysis which included: protein, fat, fiber, phosphorus, aflatoxin levels, arsenic, cadmium, calcium, lead, mercury, selenium, pesticide screen and PCB (i.e., lindane, DDT, malathion, etc.). (See Appendix 6 for basic analysis on No. 5002 feed lots.)

Water for this study was supplied to the inhalation facilities by the Kansas City Missouri Water Department. The delivered water was analyzed for metal content, mineral and physical content, pesticide residues, and nitrate content by the Kansas City Missouri Water Department. Water was then prefiltered using a 10-μm unit, treated through a charcoal bed system to remove organic materials (Model A2952, 1 cu ft, organic bed carbon exchanged every 6 months), and finally filtered at 1 μm to help remove bacteria above this size (Continental Water System, a Division of Millipore Corporation). Ethanol was mixed with filtered water and placed in pressurized carboys for supply, via the automatic watering system, to the dose groups being treated with 5% ethanol.

Airflow through the inhalation chambers provided a minimum of 10 air changes per hour as monitored by an orifice plate and a differential pressure gauge (Magnehelix®). HEPA/charcoal-filtered room air was drawn through another set of HEPA/charcoal filters prior to circulating within the inhalation chambers (Double Filtration, HEPA Corporation, Anaheim, California). Chamber exhaust air was then drawn through a charcoal bed prior to exhaustion into the atmosphere. The chambers were maintained at slightly negative pressure (i.e., 0.2 in. water). Fluorescent light was provided 12 hr/day.

Chamber environmental conditions for this program were maintained between 70°F and 78°F for temperature and 35% to 65% for relative humidity.

G. Clinical and Pathological Examination

All animals were formally examined for clinical signs of toxicity each week for the first 8 weeks and monthly thereafter. Formal palpations for tissue masses were begun at week 40 and performed monthly thereafter.

Animals were routinely observed twice daily for moribundity/mortality. Any animal exhibiting loss of or poor righting reflexes, lethargy, excess fluid discharge, neuromuscular paralysis, emaciation, jaundice, hypothermia, or life-threatening tumor mass, etc., was considered moribund. The animal number, date, time, and dose group were recorded along with observations of its condition. Animals were sacrificed using CO_2, and terminal body weight and blood smears were taken. The pathologist or prosector performed the necropsy, and the required tissues were taken with observations recorded on the pathology form.

A complete gross necropsy included collection of the following tissues:

Gross lesions
Skin
Mandibular lymph node
Mammary gland
Salivary gland
Thigh muscle
Sciatic nerve
Sternebrae, vertebrae or femur including marrow
Costochrondral junction, rib
Thymus
Larynx and pharynx
Trachea
Lungs and bronchi
Heart
Thyroid
Parathyroids
Esophagus
Stomach
Duodenum
Jejunum
Tissue masses or suspect tumors and regional lymph nodes
Ileum
Colon
Cecum
Rectum
Mesenteric lymph node
Liver
Pancreas
Spleen
Kidneys
Adrenals
Urinary bladder
Seminal vesicles
Prostate
Testes
Ovaries
Uterus
Nasal cavity and nasal turbinates
Brain
Pituitary
Spinal cord
Eyes

After the gross necropsy, all animals received a complete histopathologic examination as follows:

- Gross lesions and tissue masses (and regional lymph nodes, if possible
- Blood smear (as required by the pathologist)
- Mandibular or mesenteric lymph node
- Salivary gland
- Sternebrae, femur or vertebrae including marrow
- Thyroid
- Parathyroids
- Small intestine (one section)
- Colon
- Liver
- Prostate
- Testes
- Ovaries
- Lungs and mainstem bronchi
- Nasal cavity and nasal turbinates (three sections at (1) level of incisor teeth, (2) midway between incisors and first molar, and (3) middle of second molar - olfactory region)
- Heart
- Esophagus
- Stomach
- Uterus
- Brain (three sections, including frontal cortex and basal ganglia, parietal cortex and thalamus, and cerebellum and pons)
- Thymus
- Trachea
- Pancreas
- Spleen
- Kidneys
- Adrenals
- Urinary bladder
- Pituitary
- Spinal cord (if neurologic signs are present)
- Eyes (if grossly abnormal)
- Mammary gland
- Pharynx (if grossly abnormal)

In addition, the following organ weights were recorded at necropsy: liver, and ovaries or testes.

All tissues were preserved in 10% neutral buffered formalin, packaged in suitable containers, and shipped via commercial carrier (PET Express, Inc., Kansas City, Missouri) to Pathology Associates, Inc. (PAI), 10075 Tyler Place, Ijamsville, Maryland 21754). At PAI, tissues were processed (histology), embedded in paraffin, sectioned, and stained with hematoxylin and eosin. Histopathological evaluation (pathology) was performed at PAI.

During the last month of this study (month 24), a special study was performed on animals selected from this chronic study (metabolism, disposition, and DNA binding). The results of this study is submitted as a separate report (Part II).

III. RESULTS

A. Clinical Signs of Toxicity

Clinical signs of toxicity are summarized for male and female rats in Tables 7 and 8, respectively.

There were no noteworthy clinical signs of toxicity observed throughout the course of this study. (Clinical signs were noted with approximately equal frequency in treated and control groups.)

B. Survival

A final survival summary is presented in Table 9, and mortality is detailed by individual animal in Tables 12A through 12F for male rats and Tables 12G through 12L for female rats.

In male rats, 26/50 (52%) of the control group, 35/50 (70%) of the DS group, 26/50 (52%) of the ET group, 26/50 (52%) of the EDC group, 22/50 (44%) of the EDC/DS group, and 26/50 (52%) of the EDC/ET group male rats survived to the end of the study. Except for a higher survival rate in the DS treated group, there was no apparent difference in survival in treated animal groups versus the control group. The reason for the higher survival at 24 months in the DS group when compared to the control group is not known at this time.

In female rats, 27/50 (54%) of the control group, 33/50 (66%) of the DS group, 27/50 (54%) of the ET group, 32/50 (64%) of the EDC group, 22/50 (44%) of the EDC/DS group, and 22/50 (44%) of the EDC/ET group female rats survived to the end of the study. There was no apparent difference in survival of the treated groups when compared with the control group; however, as in the male animals, a higher survival was noted in the DS treated female group when compared with the control group. The reason for this higher survival at 24 months in the DS group is not known at this time.

C. Body Weights (Growth)

Mean body weights for male and female animals are presented graphically in Figures 4 and 5 and tabulated for the entire study with statistical evaluation in Appendix 7.

Both male and female rats treated with DS or EDC/DS gained significantly less weight over the course of the entire study when compared with their respective control groups. The Dunnett's multiple comparison test demonstrated only that the DS and EDC/DS groups in both sexes of animals were significantly different at the 5% level when compared with the control groups.

TABLE 7

SUMMARY OF CLINICAL SIGNS IN MALE RATS

	Dose Group					
Clinical Sign	Control	DS	ET	EDC	EDC/DS	EDC/ET
		6-Month Period				
Conjunctivitis	3/49	7/50	5/50	4/50	5/50	5/49
Emaciation	0/49	0/50	0/50	0/50	0/50	0/49
Epistaxis	0/49	0/50	0/50	0/50	0/50	0/49
Lacrimation	2/49	2/50	0/50	2/50	3/50	1/49
Tissue mass	2/49	0/50	0/50	0/50	0/50	0/49
		12-Month Period				
Conjunctivitis	3/48	10/50	5/48	5/49	9/48	4/48
Emaciation	0/48	0/50	0/48	0/49	0/48	0/48
Epistaxis	0/48	0/50	0/48	0/49	0/48	0/48
Lacrimation	0/48	0/50	1/48	0/49	0/48	0/48
Tissue mass	0/48	0/50	0/48	0/49	1/48	3/48
		18-Month Period				
Conjunctivitis	3/46	11/48	5/45	6/45	7/45	7/44
Emaciation	0/46	0/48	2/45	0/45	0/45	0/44
Epistaxis	0/46	2/48	0/45	0/45	0/45	0/44
Lacrimation	4/46	10/48	3/45	5/45	7/45	7/44
Tissue mass	3/46	3/48	4/45	4/45	6/45	7/44
		24-Month Period				
Conjunctivitis	4/42	6/36	2/34	2/36	4/28	2/30
Emaciation	1/32	0/36	4/34	4/36	2/28	3/30
Epistaxis	0/32	0/36	0/34	0/36	0/28	0/30
Lacrimation	4/32	6/36	2/34	2/36	4/28	2/30
Tissue mass	0/32	2/36	4/34	14/36	5/28	5/30

TABLE 8

SUMMARY OF CLINICAL SIGNS IN FEMALE RATS

	Dose Group					
Clinical Sign	Control	DS	ET	EDC	EDC/DS	EDC/ET
6-Month Period						
Conjunctivitis	1/49	2/50	3/50	2/50	3/50	0/49
Emaciation	0/49	0/50	0/50	0/50	0/50	0/49
Epistaxis	0/49	1/50	0/50	0/50	0/50	0/49
Lacrimation	1/49	2/50	3/50	1/50	1/50	0/49
Tissue mass	0/49	0/50	0/50	0/50	0/50	0/49
12-Month Period						
Conjunctivitis	2/48	2/50	5/48	3/49	3/48	3/48
Emaciation	0/48	0/50	0/48	0/49	0/48	0/48
Epistaxis	0/48	1/50	0/48	0/49	0/48	0/48
Lacrimation	0/48	0/50	1/48	0/49	0/48	0/48
Tissue mass	0/48	0/50	3/48	0/49	0/48	1/48
18-Month Period						
Conjunctivitis	2/46	2/48	4/45	6/45	3/45	2/44
Emaciation	0/46	0/48	1/45	0/45	1/45	0/44
Epistaxis	2/46	0/48	2/45	0/45	0/45	0/44
Lacrimation	2/46	2/48	4/45	5/45	3/45	2/44
Tissue mass	11/46	1/48	4/45	8/45	9/45	8/44
24-Month Period						
Conjunctivitis	0/42	1/36	2/34	2/36	3/28	4/30
Emaciation	1/32	0/36	4/34	0/36	2/28	2/30
Epistaxis	0/32	0/36	0/34	0/36	0/28	0/30
Lacrimation	0/32	1/36	2/34	2/36	3/28	4/30
Tissue mass	15/32	1/36	3/34	17/36	9/28	12/30

TABLE 9

SUMMARY OF SURVIVAL IN RATS AFTER 24 MONTHS ON TEST

	Number of Surviving Animals (%)[a]	
Dose Group	Male	Female
Control	26 (52%)	27 (54%)
DS	35 (70%)	33 (66%)
ET	26 (52%)	27 (54%)
EDC	26 (52%)	32 (64%)
EDC/DS	22 (44%)	22 (44%)
EDC/ET	26 (52%)	22 (44%)

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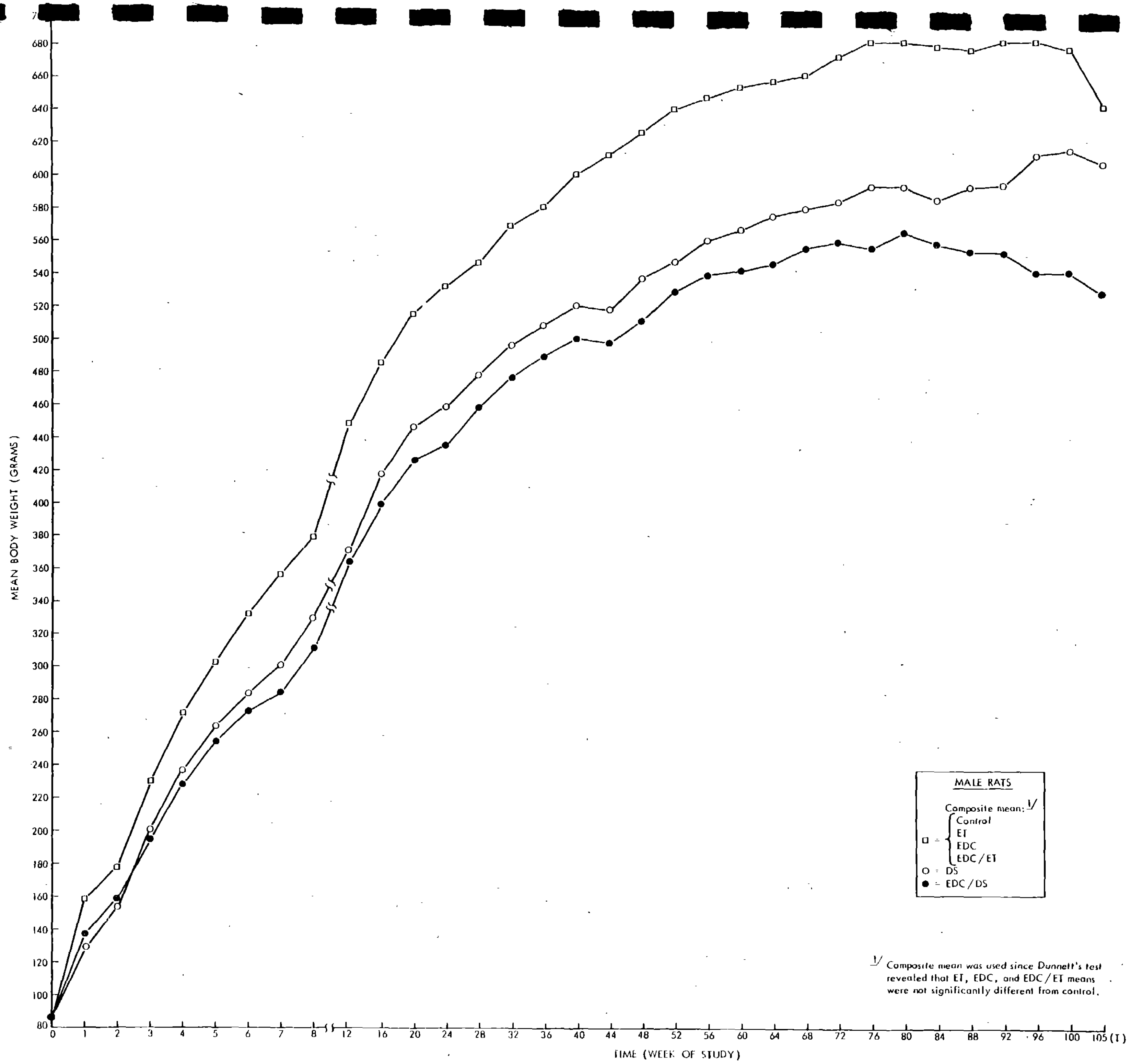
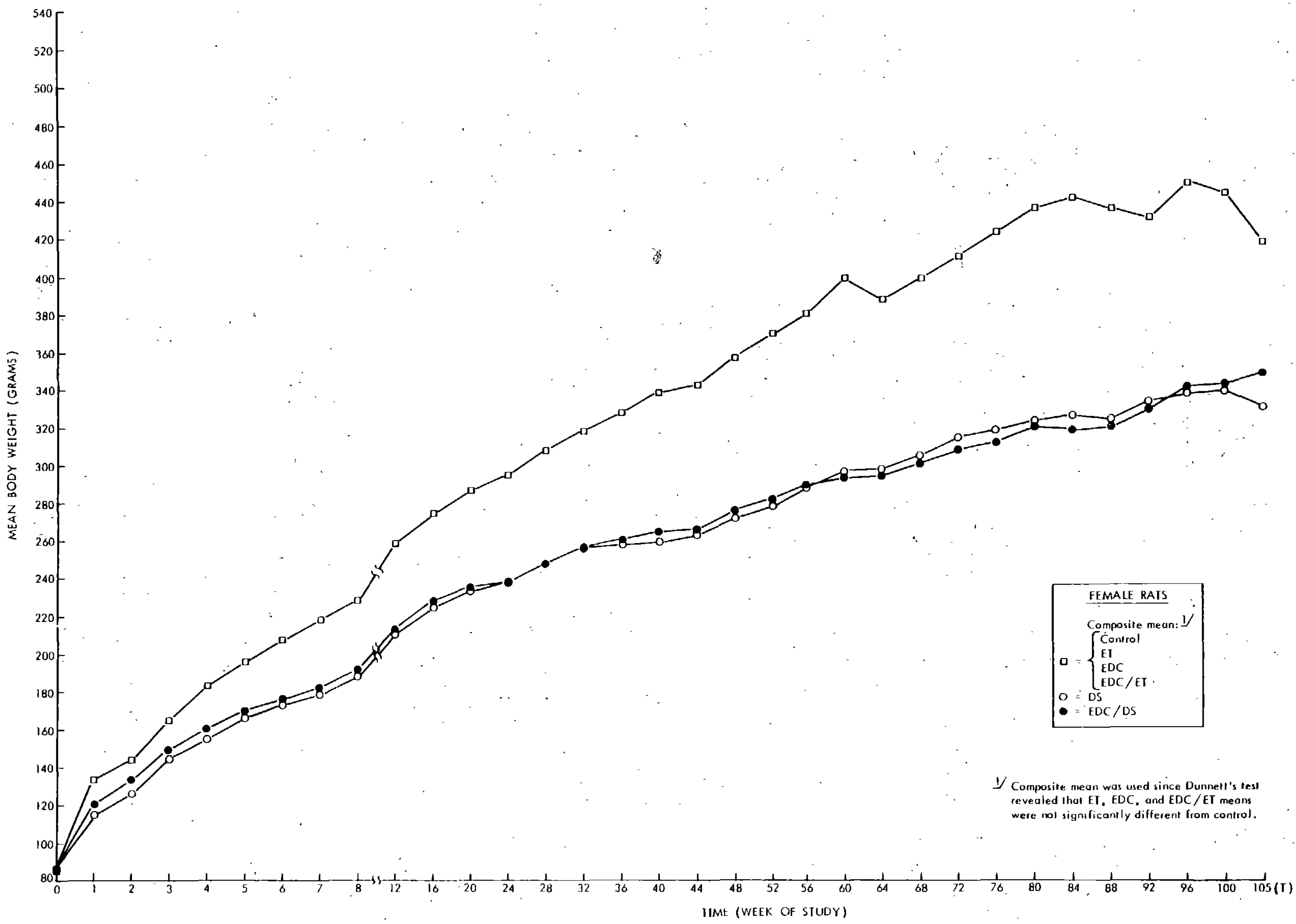
[a] Based on 50 animals/sex/group.



1/ Composite mean was used since Dunnett's test revealed that ET, EDC, and EDC/ET means were not significantly different from control.

Figure 4 - Growth Curves for Male Rats



1/ Composite mean was used since Dunnett's test revealed that ET, EDC, and EDC/ET means were not significantly different from control.

Figure 5 - Growth Curves for Female Rats

The depression of weight gain in these two treatment groups in male and female animals was due to disulfiram intake alone since there was no apparent difference between the mean body weights of the DS groups versus the EDC/DS groups; i.e., no apparent additive or synergistic effects of disulfiram and 1,2-dichloroethane on mean body weight at the concentrations tested in this study.

D. Food and Water Consumption

A summary of food consumption and water consumption are presented in Tables 10 and 11, respectively, and tabulated weekly and monthly for the entire program in Appendix 8.

1. Food consumption: In both male and female rats, the DS, ET, EDC/DS, and EDC/ET dose groups consumed overall less food when compared to their respective control groups. Animals exposed to EDC alone did not demonstrate any apparent difference in mean food consumption when compared to the control groups. The depression of mean food consumption in disulfiram treated groups is probably the result, in part, of adverse palatability of disulfiram in food, whereas the depression of mean food consumption in ethanol treated groups may represent a caloric difference (i.e., ethanol treated animals may be deriving more of their caloric intake from the alcohol than from the feed chow).

2. Water consumption: In both male and female rats, the ET, EDC, EDC/DS, and the EDC/ET dose groups consumed overall more water when compared to their respective control groups. Increased water consumption was less apparent but noted in the male but not the female disulfiram alone treated group. The increase in water consumption in ethanol treated animals is probably due in part to a dependence of these animals on alcohol. The reason for the increased water consumption, if any, in EDC treated animals is not known at this time.

E. Necropsy Observations/Organ Weights

Individual necropsy observations (tissue lesions, tissue masses, date of death, etc.) are tabulated for every animal by group in Tables 12A through 12L (12 tables).

Tissue lesions and masses were noted at necropsy with approximately equal frequency in treated male and female groups compared to their control groups except as follows: In male rats, an increased incidence of liver masses was noted in 16/50 (32%) of the EDC/DS group (Table 12E) versus 4/50 (8%) in the control group, kidney lesions in 15/50 (30%) of the EDC/ET group (Table 12F) versus 4/50 (8%) in the control group, and lesions of the testes in 12/50 (24%) of the EDC group (Table 12D) as compared with 5/50 (10%) in the control group. In female rats, the most noteworthy observation was an increased incidence of liver masses in 23/50 (46%) of the EDC/DS group (Table 12K) compared to 3/50 (6%) in the control group (tissue lesions identified at necropsy, i.e., enlarged, discolored, irregular, etc.).

TABLE 10

SUMMARY OF FOOD CONSUMPTION IN RATS AFTER 24 MONTHS ON TEST

	Male		Female	
Group	Average Mean[a] (g/day)	% Change	Average Mean (g/day)	% Change
Control	24.9	-	18.1	-
DS	21.2	-14.1	14.2	-19.6
ET	20.7	-16.3	14.5	-19.1
EDC	23.6	-3.8	17.1	-3.3
EDC/DS	20.0	-19.1	14.4	-19.6
EDC/ET	19.6	-20.6	14.6	-18.5

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[a] Average mean for entire study. See Appendix 8 for weekly or monthly tabulations.

TABLE 11

SUMMARY OF WATER CONSUMPTION IN RATS AFTER 24 MONTHS ON TEST

	Male		Female	
Group	Average Mean[a] (g/day)	% Change	Average Mean (g/day)	% Change
Control	42.3	-	40.3	-
DS	45.9	8.9	40.8	1.8
ET	48.2	14.5	45.0	11.6
EDC	48.4	15.0	45.5	13.6
EDC/DS	54.9	29.8	45.7	13.8
EDC/ET	51.8	23.0	47.9	18.9

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[a] Average mean for entire study. See Appendix 8 for weekly or monthly tabulations.

TABLE 12A

SUMMARY OF NECROPSY OBSERVATIONS IN MALE RATS (CONTROL GROUP)

Dose Group: Control
Sex: Male

TISSUE LESIONS 1/

Animal Number (Prefix Ax)	Date of Death	Adrenals	Bladder	Brain	Clitoral Glands	Heart	Kidneys	Liver	Lungs	Lymph Nodes, Mandibular	Lymph Nodes, Mesenteric	Pancreas	Pituitary	Preputial Glands	Prostate	Seminal Vesicles	Spleen	Testes	Vagina	Other
132	10/21/82							●	●											
709	7/11/83																			
187	1/3/84												●							
166	1/25/84												●							
307	3/5/64												●							
285	5/4/84		●					●					●	●						
012	5/6/84												●							
140	5/17/84												●							
809	5/18/84									●										●
218	5/18/84																			
181	5/18/84												●							
050	5/20/84												●							
205	5/24/84												●		●	●				
056	5/30/84												●							
240	6/11/84	●	●			●	●	●	●		●		●		●					●
888	7/6/84												●							
278	7/9/84							●					●							●
835	7/13/84						●	●	●				●							
153	7/18/84							●												
221	8/17/84							●					●							
030	8/22/84												●		●	●				
248	9/4/84					●	●	●	●				●		●		●	●		
323	9/10/84						●		●				●			●	●			●
249	9/11/84							●	●		●		●							
016	9/17/84																			●
028	9/17/84																			●
033	9/17/84												●							
054	9/17/84									●										
910	9/17/84							●					●					●		
810	9/17/84												●							●
936	9/17/84							●		●										
123	9/17/84							●					●							●
150	9/17/64	●											●							●
151	9/18/84																			
160	9/18/64												●							
169	9/18/84																	●		●
887	9/18/84					●							●							●
325	9/18/84																			●
717	9/20/84																			
228	9/20/84							●									●	●		●
233	9/20/84									●			●							
270	9/20/84																	●		
276	9/20/84	●											●							
279	9/20/84								●											
290	9/20/84																			
301	9/20/84												●							
320	9/20/84																			●
046	9/24/84 (S)												●							
162	9/26/84 (S)												●							
171	9/27/84 (S)														●					
Total		3	2	-	-	3	4	13	7	4	2	-	31	1	5	3	3	5	-	14

TISSUE MASSES

Animal Number (Prefix Ax)	Date of Death	Adrenals	Bladder	Brain	Cecum	Colon	Jejunum	Kidneys	Liver	Lungs	Lymph Nodes, Mandibular	Lymph Nodes, Mesenteric	Mammary	Ovary	Pancreas	Preputial Glands	Salivary Glands	Skin	Small Intestines	Spleen	Stomach	Thymus	Uterus	Other
132	10/21/82																							
709	7/11/83																	●						
187	1/3/84																							●
166	1/25/84																							
307	3/5/64																							
285	5/4/84																							
012	5/6/84																							
140	5/17/84																							
809	5/18/84																							
218	5/18/84																	●						
181	5/18/84																	●						
050	5/20/84																							
205	5/24/84																							
056	5/30/84																							
240	6/11/84	●							●			●												
888	7/6/84																●							
278	7/9/84																							●
835	7/13/84																							
153	7/18/84																							
221	8/17/84																							
030	8/22/84								●															●
248	9/4/84																							
323	9/10/84																							
249	9/11/84																							●
016	9/17/84																							
028	9/17/84																							
033	9/17/84												●											
054	9/17/84																							
910	9/17/84																							
810	9/17/84							●																
936	9/17/84								●															●
123	9/17/84																							
150	9/17/64								●															●
151	9/18/84																							
160	9/18/64																							
169	9/18/84																							
887	9/18/84																							
325	9/18/84																							
717	9/20/84																							
228	9/20/84																	●						●
233	9/20/84																							
270	9/20/84																							
276	9/20/84																							●
279	9/20/84																							
290	9/20/84																							
301	9/20/84																							
320	9/20/84																							
046	9/24/84 (S)																							
162	9/26/84 (S)																							
171	9/27/84 (S)																							
Total		1	-	-	-	-	-	1	4	-	-	1	1	-	-	-	1	4	-	-	-	-	-	8

WEEK OF DEATH

Animal Number (Prefix Ax)	Date of Death	1-52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106
132	10/21/82	● (5)																																																						
709	7/11/83	● (43)																																																						
187	1/3/84																	●																																						
166	1/25/84																				●																																			
307	3/5/64																										●																													
285	5/4/84																																		●																					
012	5/6/84																																			●																				
140	5/17/84																																				●																			
809	5/18/84																																				●																			
218	5/18/84																																				●																			
181	5/18/84																																				●																			
050	5/20/84																																				●																			
205	5/24/84																																					●																		
056	5/30/84																																						●																	
240	6/11/84																																								●															
888	7/6/84																																											●												
278	7/9/84																																												●											
835	7/13/84																																												●											
153	7/18/84																																													●										
221	8/17/84																																																	●						
030	8/22/84																																																		●					
248	9/4/84																																																				●			
323	9/10/84																																																					●		
249	9/11/84																																																					●		
016	9/17/84																																																						●	
028	9/17/84																																																						●	
033	9/17/84																																																						●	
054	9/17/84																																																						●	
910	9/17/84																																																						●	
810	9/17/84																																																						●	
936	9/17/84																																																						●	
123	9/17/84																																																						●	
150	9/17/64																																																						●	
151	9/18/84																																																						●	
160	9/18/64																																																						●	
169	9/18/84																																																						●	
887	9/18/84																																																						●	
325	9/18/84																																																						●	
717	9/20/84																																																						●	
228	9/20/84																																																						●	
233	9/20/84																																																						●	
270	9/20/84																																																						●	
276	9/20/84																																																						●	
279	9/20/84																																																						●	
290	9/20/84																																																						●	
301	9/20/84																																																						●	
320	9/20/84																																																						●	
046	9/24/84 (S)																																																							●
162	9/26/84 (S)																																																							●
171	9/27/84 (S)																																																							●
Total																																																								

1/ Tissue lesions, i.e., enlarged, discolored, irregular, etc.

(S) = Special Study Animals (Metabolism, Disposition and Binding Studies)

TABLE 12B

SUMMARY OF NECROPSY OBSERVATIONS IN MALE RATS (DS GROUP)

Dose Group: DS
Sex: Male

		TISSUE LESIONS 1/																		
Animal Number (Prefix Ax)	Date of Death	Adrenals	Bladder	Brain	Clitoral Glands	Heart	Kidneys	Liver	Lungs	Lymph Nodes, Mandibular	Lymph Nodes, Mesenteric	Pancreas	Pituitary	Preputial Glands	Prostate	Seminal Vesicles	Spleen	Testes	Vagina	Other
716	10/17/83																			●
775	1/13/84								●		●									
185	2/14/84									●	●									
128	3/19/84																			
225	4/12/84												●							
903	4/13/84			●				●			●	●	●							
196	5/7/84												●		●					
706	5/14/84												●							
708	6/1/84								●											
326	6/21/84																			
179	6/21/84							●												
714	7/3/84								●				●							
005	7/9/84												●							
039	7/13/84							●					●			●				
322	8/28/84							●					●					●		●
825	9/17/84									●										
022	9/17/84								●											
902	9/17/84	●								●			●							●
944	9/17/84								●											
075	9/17/84								●		●									●
077	9/17/84										●									
677	9/17/84									●			●							●
002	9/17/84									●								●		
801	9/17/84												●							
951	9/17/84																			●
833	9/17/84									●										
134	9/18/84																			●
711	9/18/84								●											
142	9/18/84										●									
152	9/18/84																			
836	9/18/84							●												●
170	9/16/84																			
177	9/18/84																	●		
188	9/18/84																			
202	9/18/84										●									
204	9/20/84							●												
217	9/20/84	●							●											
255	9/20/84																			
102	9/20/84																			
267	9/20/84																	●		
277	9/20/84																			
289	9/20/84																			
306	9/20/84									●										
308	9/20/84																			
834	9/20/84							●					●							
315	9/20/84								●											
319	9/20/84																			●
101	9/24/84 (S)																			
689	9/26/84 (S)																			
712	9/27/84 (S)																			
	Total	2	-	1	-	-	-	7	9	7	7	1	12	-	1	1	-	4	-	8

		TISSUE MASSES																						
Animal Number (Prefix Ax)	Date of Death	Adrenals	Bladder	Brain	Cecum	Colon	Jejunum	Kidneys	Liver	Lungs	Lymph Nodes, Mandibular	Lymph Nodes, Mesenteric	Mammary	Ovary	Pancreas	Preputial Glands	Salivary Glands	Skin	Small Intestines	Spleen	Stomach	Thymus	Uterus	Other
716	10/17/83																							
775	1/13/84																							
185	2/14/84																							
128	3/19/84							●																●
225	4/12/84																							
903	4/13/84																							
196	5/7/84																							
706	5/14/84																							
708	6/1/84																							●
326	6/21/84							●																
179	6/21/84																							
714	7/3/84																							
005	7/9/84																							●
039	7/13/84																							
322	8/28/84																							●
825	9/17/84							●																
022	9/17/84																							●
902	9/17/84							●																
944	9/17/84																							
075	9/17/84																			●				●
077	9/17/84																							
677	9/17/84																							
002	9/17/84																							●
801	9/17/84												●											
951	9/17/84																							
833	9/17/84																	●						
134	9/18/84																							●
711	9/18/84																							
142	9/18/84																							
152	9/18/84																							
836	9/18/84																●							
170	9/16/84																							
177	9/18/84																							
188	9/18/84																							
202	9/18/84																							
204	9/20/84																							
217	9/20/84																							
255	9/20/84																							
102	9/20/84									●														
267	9/20/84																							
277	9/20/84																							
289	9/20/84																							
306	9/20/84																							
308	9/20/84																							
834	9/20/84																							●
315	9/20/84																							
319	9/20/84																	●						
101	9/24/84 (S)																							
689	9/26/84 (S)																							
712	9/27/84 (S)																							
	Total	-	-	-	-	-	-	4	-	1	-	-	1	-	-	-	1	2	-	1	-	-	-	9

		WEEK OF DEATH																																																					
Animal Number (Prefix Ax)	Date of Death	1-52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106
716	10/17/83						●																																																	
775	1/13/84																		●																																					
185	2/14/84																							●																																
128	3/19/84																												●																											
225	4/12/84																															●																								
903	4/13/84																															●																								
196	5/7/84																																			●																				
706	5/14/84																																				●																			
708	6/1/84																																						●																	
326	6/21/84																																									●														
179	6/21/84																																									●														
714	7/3/84																																											●												
005	7/9/84																																												●											
039	7/13/84																																												●											
322	8/28/84																																																			●				
825	9/17/84																																																						●	
022	9/17/84																																																						●	
902	9/17/84																																																						●	
944	9/17/84																																																						●	
075	9/17/84																																																						●	
077	9/17/84																																																						●	
677	9/17/84																																																						●	
002	9/17/84																																																						●	
801	9/17/84																																																						●	
951	9/17/84																																																						●	
833	9/17/84																																																						●	
134	9/18/84																																																						●	
711	9/18/84																																																						●	
142	9/18/84																																																						●	
152	9/18/84																																																						●	
836	9/18/84																																																						●	
170	9/16/84																																																						●	
177	9/18/84																																																						●	
188	9/18/84																																																						●	
202	9/18/84																																																						●	
204	9/20/84																																																						●	
217	9/20/84																																																						●	
255	9/20/84																																																						●	
102	9/20/84																																																						●	
267	9/20/84																																																						●	
277	9/20/84																																																						●	
289	9/20/84																																																						●	
306	9/20/84																																																						●	
308	9/20/84																																																						●	
834	9/20/84																																																						●	
315	9/20/84																																																						●	
319	9/20/84																																																						●	
101	9/24/84 (S)																																																							●
689	9/26/84 (S)																																																							●
712	9/27/84 (S)																																																							●
	Total																																																							

1/ Tissue lesions, i.e., enlarged, discolored, irregular, etc.

(S) - Special Study Animals (Metabolism, Disposition and Binding Studies)

TABLE 12C

SUMMARY OF NECROPSY OBSERVATIONS IN MALE RATS (ET GROUP)

Dose Group: ET
Sex: Male

Animal Number (Prefix Ax)	Date of Death	TISSUE LESIONS 1/																			TISSUE MASSES																							WEEK OF DEATH
		Adrenals	Bladder	Brain	Clitoral Glands	Heart	Kidneys	Liver	Lungs	Lymph Nodes, Mandibular	Lymph Nodes, Mesenteric	Pancreas	Pituitary	Preputial Glands	Prostate	Seminal Vesicles	Spleen	Testes	Vagina	Other	Adrenals	Bladder	Brain	Cecum	Colon	Jejunum	Kidneys	Liver	Lungs	Lymph Nodes, Mandibular	Lymph Nodes, Mesenteric	Mammary	Ovary	Pancreas	Preputial Glands	Salivary Glands	Skin	Small Intestines	Spleen	Stomach	Thymus	Uterus	Other	
143	5/13/83		●				●			●										●																								1-52 (34)
331	5/27/83			●																																								1-52 (36)
720	12/19/83					●		●	●																																			66
006	1/11/84																																											69
234	1/29/84					●		●												●																								71
168	1/30/84												●																														●	72
052	2/14/84					●						●						●																●									●	74
145	2/18/84			●									●																															74
124	2/21/84			●						●			●																															75
297	2/27/84													●						●																								76
795	3/26/84									●							●																											80
235	5/1/84																																											85
259	6/3/84												●																															89
154	6/4/84												●					●																										90
164	6/11/84												●		●					●																								91
309	6/15/84	●					●																					●															●	91
141	7/30/84	●	●				●	●					●		●					●																								98
095	8/3/84												●																															98
793	8/8/84							●												●																								99
059	8/13/84	●				●	●	●	●				●							●																								100
334	8/18/84						●													●							●																●	100
029	8/28/84							●					●																														●	102
066	9/16/84																																											104
068	9/16/84																	●																										104
021	9/17/84					●				●										●																							●	105
034	9/18/84												●				●																										●	105
035	9/17/84								●																												●						●	105
710	9/17/84																			●																								105
756	9/17/84												●			●		●		●																			●					105
122	9/17/84						●	●		●			●							●																							●	105
832	9/18/84																			●																								105
163	9/18/84																	●																			●							105
173	9/18/84						●	●		●																																		105
182	9/18/84							●					●							●																								105
191	9/18/84															●																												105
340	9/18/84							●		●			●																															105
891	9/18/84								●								●											●																105
873	9/18/84								●	●			●																															105
226	9/18/84	●						●										●		●																								105
227	9/18/84												●							●								●									●						●	105
147	9/19/84 (S)																																											105
940	9/20/84								●																																			105
794	9/20/84												●							●																							●	105
258	9/20/84												●							●																							●	105
261	9/20/84																			●															●									105
718	9/20/84																	●																			●						●	105
845	9/20/84							●																																				105
231	9/24/84 (S)												●																															106
317	9/26/84 (S)																																											106
707	9/27/84 (S)						●						●					●																										106
	Total	4	2	3	-	5	8	12	6	8	-	1	21	1	2	2	3	8	-	19	-	-	-	-	-	-	1	3	-	-	-	-	-	1	1	-	4	-	1	-	-	-	13	

1/ Tissue lesions, i.e., enlarged, discolored, irregular, etc.

(S) = Special Study Animals (Metabolism, Disposition and Binding Studies)

TABLE 12D

SUMMARY OF NECROPSY OBSERVATIONS IN MALE RATS (EDC GROUP)

Dose Group: EDC
Sex: Male

Animal Number (Prefix Ax.)	Date of Death	TISSUE LESIONS[1]																			TISSUE MASSES																							WEEK OF DEATH																																																						
		Adrenals	Bladder	Brain	Clitoral Glands	Heart	Kidneys	Liver	Lungs	Lymph Nodes, Mandibular	Lymph Nodes, Mesenteric	Pancreas	Pituitary	Preputial Glands	Prostate	Seminal Vesicles	Spleen	Testes	Vagina	Other	Adrenals	Bladder	Brain	Cecum	Colon	Jejunum	Kidneys	Liver	Lungs	Lymph Nodes, Mandibular	Lymph Nodes, Mesenteric	Mammary	Ovary	Pancreas	Preputial Glands	Salivary Glands	Skin	Small Intestines	Spleen	Stomach	Thymus	Uterus	Other	1-52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106
096	3/18/83																																											● (25)																																																							
229	8/29/83																																										●	● (26)																																																							
269	1/5/84												●																			●																												●																																												
003	1/10/84												●																																																	●																																											
332	1/11/84												●																																																	●																																												
281	2/16/84									●	●		●																																																							●																																								
015	2/23/84																																			●	●						●																										●																																						
300	3/20/84																																																																							●																																					
009	4/8/84							●		●	●																																																															●																																					
293	5/6/84												●																																																																	●																															
925	5/24/84						●	●				●				●		●		●							●										●																																											●																													
282	6/1/84																			●												●																																																				●																												
292	6/6/84							●					●																														●																																															●																											
263	6/18/84						●	●					●																																																																												●																													
115	7/20/84												●			●																																																																											●																					
330	8/3/84							●																								●											●																																																						●																			
222	8/3/84					●		●					●					●																									●																																																					●																			
084	8/17/84												●							●																																																																																		●																	
273	8/17/84																																										●																																																											●																	
847	8/22/84	●				●	●	●										●																									●																																																										●																
676	8/29/84							●					●																																																																																										●															
019	8/29/84												●																														●																																																													●															
303	9/11/84							●	●				●		●																																																																																								●														
875	9/14/84						●		●									●		●																							●																																																															●														
014	9/17/84																																										●																																																																●													
025	9/17/84						●	●									●			●																																																																																						●													
814	9/17/84									●																																	●																																																															●													
953	9/17/84							●	●											●																																																																																				●													
895	9/17/84							●					●					●																									●																																																													●													
906	9/18/84							●		●																																	●																																																															●													
679	9/18/84 (S)								●																			●															●																																																															●													
129	9/18/84	●					●	●					●														●																																																																													●													
884	9/18/84	●																●		●																																																																																						●													
687	9/18/84																															●																																																																												●													
211	9/18/84	●					●						●							●																																																																																				●													
907	9/18/84								●				●																																																																																														●													
724	9/18/84							●					●														●																●																																																														●													
210	9/18/84	●								●			●							●																																																																																				●													
237	9/18/84							●					●																																																																																														●													
858	9/18/84	●					●	●					●				●	●		●														●									●																																																													●													
252	9/18/84	●								●			●					●									●																●																																																											●													
335	9/18/84																	●		●																							●																																																														●													
271	9/20/84								●											●				●																			●																																																														●													
945	9/20/84							●					●																								●																																																																					●													
288	9/20/84												●							●																																																																																				●													
908	9/20/84															●		●		●																																																																																				●													
318	9/20/84 (S)																										●										●																																																																						●													
013	9/24/84 (S)							●	●	●	●				●	●	●	●		●							●																																																																																		●
248	9/25/84 (S)														●			●																																																																																													●
010	9/27/84 (S)																																																																																																													●
	Total	7	-	-	-	2	8	19	7	7	3	1	24	-	3	4	3	12	-	15	-	-	-	1	-	-	6	1	-	-	-	4	-	1	-	1	4	-	-	-	-	-	19																																																												

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[1] Tissue lesions, i.e., enlarged, discolored, irregular, etc.

(S) = Special Study Animals (Metabolism, Disposition and Binding Studies)

TABLE 12E

SUMMARY OF NECROPSY OBSERVATIONS IN MALE RATS (EDC/DS GROUP)

Dose Group: EDC/DS
Sex: Male

		TISSUE LESIONS [1]																		
Animal Number (Prefix Ax)	Date of Death	Adrenals	Bladder	Brain	Clitoral Glands	Heart	Kidneys	Liver	Lungs	Lymph Nodes, Mandibular	Lymph Nodes, Mesenteric	Pancreas	Pituitary	Preputial Glands	Prostate	Seminal Vesicles	Spleen	Testes	Vagina	Other
070	6/20/83																			
176	8/9/83																			●
291	9/23/83												●							●
209	11/8/83																			●
024	1/3/84										●		●							
768	3/16/84										●		●		●					
008	3/20/84																			
329	4/7/84					●		●			●			●						●
314	5/11/84												●		●					
186	5/17/84																			
781	5/19/84																			
053	5/21/84		●															●		
780	5/24/84																			
183	5/29/84						●						●		●					
722	5/30/84																			
923	5/31/84												●							
061	6/8/84						●	●					●							
798	6/13/84																			
283	6/19/84							●					●							
189	6/26/84																	●		●
313	7/6/84							●					●							●
922	7/15/84																●			
118	7/23/84						●	●		●			●		●					
174	8/1/84							●					●							
090	8/7/84							●												
310	8/8/84																	●		
064	8/17/84												●							
076	9/6/84	●					●	●	●				●			●	●	●		
256	9/17/84(S)															●		●		
846	9/17/84							●	●	●							●			
023	9/17/84									●										
044	9/17/84												●					●		●
955	9/17/84	●						●	●		●									
062	9/17/84							●												
779	9/18/84	●						●			●									●
114	9/18/84							●										●		●
688	9/18/84						●			●										●
135	9/18/84															●	●			
137	9/18/84							●										●		●
158	9/18/84															●				
201	9/20/84								●											
203	9/20/84												●							
220	9/20/84							●					●					●		●
223	9/20/84							●								●				●
905	9/20/84																			
242	9/20/84 (S)								●							●		●		
924	9/20/84 |																			
048	9/24/84 (S)																			
065	9/25/84 (S)																	●		
060	9/27/84 (S)																			
	Total	3	1	-	-	1	5	16	5	4	5	-	16	1	4	6	4	11	-	13

	TISSUE MASSES																						
Animal Number (Prefix Ax)	Adrenals	Bladder	Brain	Cecum	Colon	Jejunum	Kidneys	Liver	Lungs	Lymph Nodes, Mandibular	Lymph Nodes, Mesenteric	Mammary	Ovary	Pancreas	Preputial Glands	Salivary Glands	Skin	Small Intestines	Spleen	Stomach	Thymus	Uterus	Other
070																							
176																							
291									●														●
209																							
024																							
768																							
008																	●						
329																							
314								●															
186												●											●
781																							
053																							
780																							●
183																							●
722						●																	●
923																							
061																							
798								●	●														●
283																							
189								●															●
313																							
922																			●				
118																							
174																							
090																							
310								●															
064								●															●
076																							
256								●															●
846																							
023								●															●
044																							●
955																							●
062								●									●						●
779								●									●						●
114																	●						
688									●														
135						●		●									●						
137								●									●						
158								●									●						●
201									●														
203								●															
220								●															
223								●															●
905																							●
242																							
924								●															●
048																							
065																							●
060																							
Total	-	-	-	-	-	2	-	16	4	-	-	4	-	-	-	-	7	-	1	-	-	-	19

Animal Number (Prefix Ax)	WEEK OF DEATH
070	1-52 ●(40)
176	1-52 ●(47)
291	53
209	60
024	68
768	78
008	79
329	81
314	86
186	87
781	87
053	88
780	88
183	89
722	89
923	89
061	90
798	91
283	92
189	93
313	94
922	95
118	97
174	98
090	99
310	99
064	100
076	103
256	105
846	105
023	105
044	105
955	105
062	105
779	105
114	105
688	105
135	105
137	105
158	105
201	105
203	105
220	105
223	105
905	105
242	105
924	105
048	106
065	106
060	106

[1] Tissue lesions, i.e., enlarged, discolored, irregular, etc.

(S) = Special Study Animals (Metabolism, Disposition and Binding Studies)

TABLE 12F

SUMMARY OF NECROPSY OBSERVATIONS IN MALE RATS (EDC/ET GROUP)

Dose Group: EDC/ET
Sex: Male

Animal Number (Prefix Ax)	Date of Death	TISSUE LESIONS 1/																			TISSUE MASSES																						
		Adrenals	Bladder	Brain	Clitoral Glands	Heart	Kidneys	Liver	Lungs	Lymph Nodes, Mandibular	Lymph Nodes, Mesenteric	Pancreas	Pituitary	Preputial Glands	Prostate	Seminal Vesicles	Spleen	Testes	Vagina	Other	Adrenals	Bladder	Brain	Cecum	Colon	Jejunum	Kidneys	Liver	Lungs	Lymph Nodes, Mandibular	Lymph Nodes, Mesenteric	Mammary	Ovary	Pancreas	Preputial Glands	Salivary Glands	Skin	Small Intestines	Spleen	Stomach	Thymus	Uterus	Other
157	10/18/82																					●																					
821	7/29/83		●				●													●																							
238	9/11/83																											●															●
690	10/11/83																																				●						●
299	11/15/83		●				●													●																●							
840	12/6/83						●						●							●																							
103	3/27/84																●															●		●									
072	4/4/84												●				●	●														●											
197	4/18/84		●					●					●				●																										
098	4/24/84																																		●								
312	5/10/84												●																			●											
876	5/31/84																	●																									
032	6/13/84						●	●					●																			●											
214	6/15/84						●						●					●																									●
339	6/15/84																			●																							
928	6/15/84																																										
927	6/15/84							●					●					●		●																							●
230	6/19/84						●	●							●	●																											
929	6/26/84	●				●	●	●	●											●																							●
040	7/16/84						●	●															●																				
175	7/20/84												●		●		●			●																							
007	7/30/84												●				●																										
239	7/30/84							●					●			●	●			●																							●
333	9/5/84					●		●					●							●																							
018	9/17/84							●					●							●																			●				
926	9/17/84									●																																	●
049	9/17/84												●					●										●															
727	9/17/84								●	●																											●						●
138	9/17/84						●																																				
149	9/18/84						●													●								●															
159	9/18/84						●	●										●		●																							
161	9/18/84							●	●																																		
178	9/18/84												●				●			●																							
865	9/18/84					●	●									●																											
184	9/18/84																			●																							
190	9/18/84	●					●											●		●																							
192	9/18/84								●											●							●																	●
244	9/20/84	●						●					●							●								●									●						
250	9/20/84								●											●																							
253	9/20/84																																										
265	9/20/84						●	●					●							●												●											●
850	9/20/84																																										
280	9/20/84																	●										●									●						
286	9/20/84									●																																	
841	9/20/84																																										
298	9/20/84							●												●																							
316	9/20/84																																										
304	9/24/84 (S)																	●									●																
206	9/25/84 (S)																																										
728	9/27/84 (S)						●						●																														
	Total	3	3	-	-	3	15	14	5	3	-	-	17	-	2	3	7	9	-	20	-	1	1	-	-	-	2	5	-	-	-	5	-	1	1	1	4	-	-	-	-	-	10

Animal Number (Prefix Ax)	WEEK OF DEATH																																																					
	1-52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106
157	● (5)																																																						
821	● (45)																																																						
238	● (51)																																																						
690					●																																																		
299									●																																														
840													●																																										
103																													●																										
072																														●																									
197																																●																							
098																																	●																						
312																																			●																				
876																																						●																	
032																																								●															
214																																								●															
339																																								●															
928																																								●															
927																																								●															
230																																									●														
929																																										●													
040																																												●										
175																																												●										
007																																														●								
239																																														●								
333																																																			●			
018																																																					●	
926																																																					●	
049																																																					●	
727																																																					●	
138																																																					●	
149																																																					●	
159																																																					●	
161																																																					●	
178																																																					●	
865																																																					●	
184																																																					●	
190																																																					●	
192																																																					●	
244																																																					●	
250																																																					●	
253																																																					●	
265																																																					●	
850																																																					●	
280																																																					●	
286																																																					●	
841																																																					●	
298																																																					●	
316																																																					●	
304																																																						●
206																																																						●
728																																																						●

1/ Tissue lesions, i.e., enlarged, discolored, irregular, etc.
(S) = Special Study Animals (Metabolism, Disposition and Binding Studies)

TABLE 12G

SUMMARY OF NECROPSY OBSERVATIONS IN FEMALE RATS (CONTROL GROUP)

Dose Group: Control
Sex: Female

		TISSUE LESIONS[1]																		
Animal Number (Prefix Ax)	Date of Death	Adrenals	Bladder	Brain	Clitoral Glands	Heart	Kidneys	Liver	Lungs	Lymph Nodes, Mandibular	Lymph Nodes, Mesenteric	Pancreas	Pituitary	Preputial Glands	Prostate	Seminal Vesicles	Spleen	Testes	Vagina	Other
389	11/17/83												●							●
889	11/30/83					●							●							
765	12/12/83							●					●							
500	12/15/83												●							
737	1/25/84							●									●			●
448	2/13/84						●						●							
608	3/5/84												●				●			●
366	3/19/84												●							
657	4/10/84									●			●							
476	5/4/84												●							
539	5/17/84																			
527	6/29/84						●	●	●				●							●
559	7/2/84	●						●					●							●
650	7/3/84							●					●							
774	7/9/84	●						●	●				●							
511	7/13/84												●							
603	7/20/84							●		●										●
343	8/1/84							●	●				●							
386	8/10/84												●							
352	8/12/84												●							
947	8/13/84												●							●
666	8/22/84	●						●												
418	8/22/84						●	●					●						●	●
351	9/18/84								●				●							●
912	9/18/84												●							●
378	9/18/84	●											●							
384	9/18/84	●																		●
414	9/18/84							●												●
952	9/18/84												●							●
473	9/18/84																			
490	9/18/84	●											●							
533	9/18/84												●							
913	9/18/84	●																		
540	9/18/84								●				●							●
557	9/18/84												●							
577	9/19/84 (S)												●							
579	9/19/84								●				●							
862	9/19/84	●											●							
615	9/19/84	●											●							●
629	9/19/84							●					●							
638	9/19/84	●											●							
620	9/19/84	●																		●
644	9/19/84	●											●							●
648	9/19/84												●							●
654	9/19/84	●											●							
937	9/19/84	●								●			●							●
938	9/19/84									●										
416	9/25/84 (S)												●							
356	9/26/84 (S)												●							
361	9/27/84 (S)												●							
	Total	14	-	-	-	1	3	12	6	4	-	-	40	-	-	-	2	-	1	19

		TISSUE MASSES																						
Animal Number (Prefix Ax)	Date of Death	Adrenals	Bladder	Brain	Cecum	Colon	Jejunum	Kidneys	Liver	Lungs	Lymph Nodes, Mandibular	Lymph Nodes, Mesenteric	Mammary	Ovary	Pancreas	Preputial Glands	Salivary Glands	Skin	Small Intestines	Spleen	Stomach	Thymus	Uterus	Other
389	11/17/83												●											
889	11/30/83																							
765	12/12/83																							
500	12/15/83																							
737	1/25/84																						●	
448	2/13/84								●									●						
608	3/5/84																							
366	3/19/84												●											
657	4/10/84			●									●											
476	5/4/84																		●					
539	5/17/84												●											
527	6/29/84																							
559	7/2/84													●										
650	7/3/84																							
774	7/9/84																							●
511	7/13/84																							
603	7/20/84																							●
343	8/1/84																							●
386	8/10/84													●										
352	8/12/84																							
947	8/13/84																							
666	8/22/84																							●
418	8/22/84																							
351	9/18/84													●				●						
912	9/18/84													●										●
378	9/18/84												●										●	
384	9/18/84													●										
414	9/18/84																						●	●
952	9/18/84																							
473	9/18/84												●											
490	9/18/84																							
533	9/18/84												●											
913	9/18/84								●															
540	9/18/84																							
557	9/18/84																							
577	9/19/84 (S)																							
579	9/19/84																						●	●
862	9/19/84																							
615	9/19/84												●											
629	9/19/84								●				●											
638	9/19/84													●										
620	9/19/84																							
644	9/19/84																						●	●
648	9/19/84												●		●									
654	9/19/84																							●
937	9/19/84							●																●
938	9/19/84																						●	
416	9/25/84 (S)							●																
356	9/26/84 (S)																							
361	9/27/84 (S)																							●
	Total	-	-	1	-	-	-	2	3	-	-	-	10	6	1	-	-	2	1	-	-	-	6	11

		WEEK OF DEATH																																																						
Animal Number (Prefix Ax)	Date of Death	1-52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106
389	11/17/83										●																																													
889	11/30/83												●																																											
765	12/12/83														●																																									
500	12/15/83														●																																									
737	1/25/84																				●																																			
448	2/13/84																							●																																
608	3/5/84																										●																													
366	3/19/84																												●																											
657	4/10/84																															●																								
476	5/4/84																																		●																					
539	5/17/84																																				●																			
527	6/29/84																																										●													
559	7/2/84																																											●												
650	7/3/84																																											●												
774	7/9/84																																												●											
511	7/13/84																																												●											
603	7/20/84																																													●										
343	8/1/84																																															●								
386	8/10/84																																																●							
352	8/12/84																																																●							
947	8/13/84																																																	●						
666	8/22/84																																																		●					
418	8/22/84																																																		●					
351	9/18/84																																																						●	
912	9/18/84																																																						●	
378	9/18/84																																																						●	
384	9/18/84																																																						●	
414	9/18/84																																																						●	
952	9/18/84																																																						●	
473	9/18/84																																																						●	
490	9/18/84																																																						●	
533	9/18/84																																																						●	
913	9/18/84																																																						●	
540	9/18/84																																																						●	
557	9/18/84																																																						●	
577	9/19/84 (S)																																																						●	
579	9/19/84																																																						●	
862	9/19/84																																																						●	
615	9/19/84																																																						●	
629	9/19/84																																																						●	
638	9/19/84																																																						●	
620	9/19/84																																																						●	
644	9/19/84																																																						●	
648	9/19/84																																																						●	
654	9/19/84																																																						●	
937	9/19/84																																																						●	
938	9/19/84																																																						●	
416	9/25/84 (S)																																																							●
356	9/26/84 (S)																																																							●
361	9/27/84 (S)																																																							●

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[1] Tissue lesions, i.e., enlarged, discolored, irregular, etc.

(S) - Special Study Animals (Metabolism, Disposition and Binding Studies)

TABLE 12H

SUMMARY OF NECROPSY OBSERVATIONS IN FEMALE RATS (DS GROUP)

Dose Group: DS
Sex: Female

		TISSUE LESIONS 1/																			TISSUE MASSES																						
Animal Number (Prefix Ax)	Date of Death	Adrenals	Bladder	Brain	Clitoral Glands	Heart	Kidneys	Liver	Lungs	Lymph Nodes: Mandibular	Lymph Nodes, Mesenteric	Pancreas	Pituitar	Preputial Glands	Prostate	Seminal Vesicles	Spleen	Testes	Vagina	Other	Adrenals	Bladder	Brain	Cecum	Colon	Jejunum	Kidneys	Liver	Lungs	Lymph Nodes, Mandibular	Lymph Nodes, Mesenteric	Mammar.	Ovar.	Pancreas	Preputial Glands	Salivary Glands	Skin	Small Intestines	Spleen	Stomach	Thymus	Uterus	Other
612	12/5/83												●																			●		●									
617	1/27/84										●		●																														
734	3/5/64																												●							●						●	●
522	3/5/84										●		●																														
704	3/7/84												●																			●											
766	3/26/84												●				●								●		●														●		
595	4/2/84										●		●																														
791	4/13/84										●		●																														
382	4/23/84									●			●																														
402	4/27/84												●																														
480	5/30/84	●											●							●																							
813	6/6/84												●																														
376	6/13/84							●					●																														
493	7/3/84							●	●				●																														
561	7/8/84												●																														
353	9/4/84												●														●																
705	9/13/84												●																														
342	9/17/84								●				●							●																							●
357	9/17/84							●	●				●																														
367	9/17/84							●																																		●	
948	9/17/84								●																																		
415	9/17/84										●		●																														
422	9/17/84												●																			●											●
430	9/17/84							●		●										●																							
733	9/19/84												●																														
939	9/19/84																																●										
501	9/19/84	●						●	●				●							●												●											
502	9/19/84	●																		●																							
507	9/19/84										●																					●	●										
771	9/19/84								●																								●										
512	9/19/84												●																														
518	9/19/84																																										
524	9/19/84								●																																	●	
525	9/19/84										●		●																														
776	9/19/84								●				●																														
568	9/19/84	●											●																														
574	9/19/84												●																			●											
871	9/19/84												●													●																	
587	9/19/84												●																				●										
590	9/19/84	●						●					●																														●
915	9/19/84	●											●																													●	
602	9/19/84							●																																		●	
604	9/19/84												●							●																						●	
916	9/19/84										●		●																														
917	9/19/84												●																														
812	9/19/84								●				●																														●
838	9/19/84												●																								●						●
914	9/25/84 (S)																																										
856	9/26/64 (S)												●																														
578	9/27/84 (S)	●								●			●																														
	Total	7	-	-	-	-	-	8	9	3	8	-	38	-	-	-	1	-	-	6	-	-	-	-	1	1	2	-	1	-	-	6	4	1	-	1	1	-	-	-	1	6	6

		WEEK OF DEATH																																																				
Animal Number (Prefix Ax)	Date of Death	1-52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106
612	12/5/83													●																																										
617	1/27/84																				●																																			
734	3/5/64																									●																														
522	3/5/84																									●																														
704	3/7/84																									●																														
766	3/26/84																												●																											
595	4/2/84																													●																										
791	4/13/84																														●																									
382	4/23/84																																●																							
402	4/27/84																																●																							
480	5/30/84																																					●																		
813	6/6/84																																						●																	
376	6/13/84																																							●																
493	7/3/84																																										●													
561	7/8/84																																										●													
353	9/4/84																																																			●			
705	9/13/84																																																				●		
342	9/17/84																																																					●	
357	9/17/84																																																					●	
367	9/17/84																																																					●	
948	9/17/84																																																					●	
415	9/17/84																																																					●	
422	9/17/84																																																					●	
430	9/17/84																																																					●	
733	9/19/84																																																					●	
939	9/19/84																																																					●	
501	9/19/84																																																					●	
502	9/19/84																																																					●	
507	9/19/84																																																					●	
771	9/19/84																																																					●	
512	9/19/84																																																					●	
518	9/19/84																																																					●	
524	9/19/84																																																					●	
525	9/19/84																																																					●	
776	9/19/84																																																					●	
568	9/19/84																																																					●	
574	9/19/84																																																					●	
871	9/19/84																																																					●	
587	9/19/84																																																					●	
590	9/19/84																																																					●	
915	9/19/84																																																					●	
602	9/19/84																																																					●	
604	9/19/84																																																					●	
916	9/19/84																																																					●	
917	9/19/84																																																					●	
812	9/19/84																																																					●	
838	9/19/84																																																					●	
914	9/25/84 (S)																																																						●
856	9/26/64 (S)																																																						●
578	9/27/84 (S)																																																						●
	Total																																																							

1/ Tissue lesions, i.e., enlarged, discolored, irregular, etc.

(S) - Special Study Animals (Metabolism, Disposition and Binding Studies)

TABLE 12I

SUMMARY OF NECROPSY OBSERVATIONS IN FEMALE RATS (ET GROUP)

Dose Group: ET
Sex: Female

Animal Number (Prefix Ax)	Date of Death	TISSUE LESIONS [1]																		
		Adrenals	Bladder	Brain	Clitoral Glands	Heart	Kidneys	Liver	Lungs	Lymph Nodes, Mandibular	Lymph Nodes, Mesenteric	Pancreas	Pituitary	Preputial Glands	Prostate	Seminal Vesicles	Spleen	Testes	Vagina	Other
651	9/7/83	●						●												
423	9/26/83												●							
623	10/4/83						●				●		●				●			
368	12/3/83												●							
830	12/12/83																			
404	1/9/84	●															●			
373	1/19/84												●							
894	1/30/84									●			●				●			
839	2/15/84												●							
565	2/17/84												●							
778	2/27/84			●									●							
392	3/21/84												●							
452	4/6/84	●											●							●
649	5/18/84												●							
605	5/24/84												●							
738	5/24/84	●											●							
354	6/4/84	●						●	●	●			●							
486	6/7/84												●							
920	6/15/84												●							
634	6/19/84					●	●	●					●							●
757	6/21/84							●					●							
433	8/10/84							●					●							
553	9/3/84							●					●							
380	9/18/84							●					●							●
413	9/18/84								●				●							
892	9/18/84	●											●							●
893	9/18/84	●	●																	●
699	9/19/84	●					●													●
431	9/19/84																			●
432	9/19/84												●							
436	9/19/84												●							●
494	9/19/84									●										
514	9/19/84	●											●							●
919	9/19/84							●		●			●							●
521	9/19/84							●					●							
523	9/19/84	●											●							●
532	9/20/84	●											●							
941	9/20/84								●				●							
802	9/20/84									●										
543	9/20/84												●							
545	9/20/84							●												
567	9/20/84												●							●
582	9/20/84												●							●
596	9/20/84												●							
599	9/20/84							●					●							
611	9/20/84							●												
703	9/20/84						●	●					●							●
700	9/25/84 (S)												●							
505	9/26/84 (S)																			
918	9/27/84 (S)	●					●	●												●
Total		12	1	1	-	1	5	14	3	5	1	-	38	-	-	-	3	-	-	15

Animal Number (Prefix Ax)	Date of Death	TISSUE MASSES																						
		Adrenals	Bladder	Brain	Cecum	Colon	Jejunum	Kidneys	Liver	Lungs	Lymph Nodes, Mandibular	Lymph Nodes, Mesenteric	Mammary	Ovary	Pancreas	Preputial Glands	Salivary Glands	Skin	Small Intestines	Spleen	Stomach	Thymus	Uterus	Other
651	9/7/83																							
423	9/26/83												●											
623	10/4/83																							
368	12/3/83																							
830	12/12/83																							
404	1/9/84									●														●
373	1/19/84																							
894	1/30/84																							●
839	2/15/84																							
565	2/17/84																							
778	2/27/84																							
392	3/21/84												●										●	
452	4/6/84																							
649	5/18/84													●				●						
605	5/24/84												●	●										
738	5/24/84												●											●
354	6/4/84																							
486	6/7/84													●										
920	6/15/84																							●
634	6/19/84												●											●
757	6/21/84												●	●										
433	8/10/84																							●
553	9/3/84																						●	
380	9/18/84																							
413	9/18/84																							
892	9/18/84																							
893	9/18/84																							
699	9/19/84													●										●
431	9/19/84																							●
432	9/19/84												●											
436	9/19/84												●											●
494	9/19/84																							
514	9/19/84																						●	
919	9/19/84																							
521	9/19/84																							
523	9/19/84																						●	
532	9/20/84																						●	
941	9/20/84																							●
802	9/20/84																							
543	9/20/84												●	●									●	
545	9/20/84																							
567	9/20/84																						●	●
582	9/20/84																							
596	9/20/84																						●	
599	9/20/84												●	●										
611	9/20/84																						●	
703	9/20/84	●																						
700	9/25/84 (S)																							
505	9/26/84 (S)																							
918	9/27/84 (S)													●										
Total		1	-	-	-	-	-	-	-	1	-	-	10	8	-	-	-	1	-	-	-	-	9	11

Animal Number (Prefix Ax)	Date of Death	WEEK OF DEATH																																																				
		1-52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106
651	9/7/83	● (51)																																																						
423	9/26/83			●																																																				
623	10/4/83				●																																																			
368	12/3/83												●																																											
830	12/12/83														●																																									
404	1/9/84																		●																																					
373	1/19/84																			●																																				
894	1/30/84																					●																																		
839	2/15/84																							●																																
565	2/17/84																							●																																
778	2/27/84																									●																														
392	3/21/84																												●																											
452	4/6/84																														●																									
649	5/18/84																																				●																			
605	5/24/84																																					●																		
738	5/24/84																																					●																		
354	6/4/84																																							●																
486	6/7/84																																							●																
920	6/15/84																																								●															
634	6/19/84																																									●														
757	6/21/84																																									●														
433	8/10/84																																																●							
553	9/3/84																																																				●			
380	9/18/84																																																						●	
413	9/18/84																																																						●	
892	9/18/84																																																						●	
893	9/18/84																																																						●	
699	9/19/84																																																						●	
431	9/19/84																																																						●	
432	9/19/84																																																						●	
436	9/19/84																																																						●	
494	9/19/84																																																						●	
514	9/19/84																																																						●	
919	9/19/84																																																						●	
521	9/19/84																																																						●	
523	9/19/84																																																						●	
532	9/20/84																																																						●	
941	9/20/84																																																						●	
802	9/20/84																																																						●	
543	9/20/84																																																						●	
545	9/20/84																																																						●	
567	9/20/84																																																						●	
582	9/20/84																																																						●	
596	9/20/84																																																						●	
599	9/20/84																																																						●	
611	9/20/84																																																						●	
703	9/20/84																																																						●	
700	9/25/84 (S)																																																							●
505	9/26/84 (S)																																																							●
918	9/27/84 (S)																																																							●
Total																																																								

[1] Tissue lesions, i.e., enlarged, discolored, irregular, etc.

(S) = Special Study Animals (Metabolism, Disposition and Binding Studies)

TABLE 12J

SUMMARY OF NECROPSY OBSERVATIONS IN FEMALE RATS (EDC GROUP)

Dose Group: EDC
Sex: Female

		TISSUE LESIONS[1]																		
Animal Number (Prefix Ax)	Date of Death	Adrenals	Bladder	Brain	Clitoral Glands	Heart	Kidneys	Liver	Lungs	Lymph Nodes, Mandibular	Lymph Nodes, Mesenteric	Pancreas	Pituitary	Preputial Glands	Prostate	Seminal Vesicles	Spleen	Testes	Vagina	Other
372	8/9/83												●							
564	1/13/84												●							●
576	2/1/84									●			●							
760	2/2/84			●									●							
842	2/7/84	●	●				●				●		●							
516	2/16/84	●											●							●
503	3/6/84												●							
570	3/28/84									●			●							
653	4/1/84												●							
362	4/10/84												●							●
401	4/16/84												●							
853	4/23/84												●							
783	6/7/84						●						●							
934	6/27/84							●					●							
726	6/27/84							●					●							
817	6/29/84						●	●					●							
535	7/6/84												●							
645	8/10/84							●					●							
344	9/18/84								●				●							●
898	9/18/84	●						●		●										
692	9/18/84																			
385	9/18/84							●					●							●
932	9/18/84 (S)												●							
403	9/18/84	●						●		●			●							
407	9/18/84												●							
899	9/18/84	●											●							
950	9/18/84	●																		
484	9/18/84	●						●					●							●
946	9/18/84								●				●							●
497	9/18/84																			
456	9/19/84												●							
468	9/19/84	●																		
470	9/19/84												●							
498	9/19/84	●					●	●					●							●
526	9/19/84												●							
725	9/19/84								●	●										
547	9/19/84												●							
933	9/19/84																			
588	9/19/84							●					●							
594	9/19/84	●																		●
879	9/19/84								●				●							●
866	9/19/84																			
631	9/19/84												●							
635	9/19/84							●												●
773	9/19/84 (S)							●					●							
662	9/19/84	●											●							●
672	9/19/84	●																		
387	9/24/84 (S)	●											●							
360	9/25/84 (S)												●							●
420	9/26/84 (S)																			
	Total	13	1	1	-	-	4	12	4	5	1	-	38	-	-	-	-	-	-	13

		TISSUE MASSES																						
Animal Number (Prefix Ax)	Date of Death	Adrenals	Bladder	Brain	Cecum	Colon	Jejunum	Kidneys	Liver	Lungs	Lymph Nodes, Mandibular	Lymph Nodes, Mesenteric	Mammary	Ovary	Pancreas	Preputial Glands	Salivary Glands	Skin	Small Intestines	Spleen	Stomach	Thymus	Uterus	Other
372	8/9/83																							
564	1/13/84																							
576	2/1/84																							●
760	2/2/84												●											
842	2/7/84																							
516	2/16/84																							
503	3/6/84												●											
570	3/28/84												●					●						
653	4/1/84												●											
362	4/10/84				●			●	●												●			
401	4/16/84																							
853	4/23/84																							
783	6/7/84													●										●
934	6/27/84												●	●										
726	6/27/84								●				●											●
817	6/29/84												●											
535	7/6/84																							
645	8/10/84																							
344	9/18/84																							
898	9/18/84																							
692	9/18/84																							●
385	9/18/84												●											●
932	9/18/84 (S)													●										
403	9/18/84																							
407	9/18/84							●					●											●
899	9/18/84																							
950	9/18/84																							
484	9/18/84												●											●
946	9/18/84																						●	
497	9/18/84												●											
456	9/19/84																							●
468	9/19/84																							●
470	9/19/84													●										●
498	9/19/84												●											●
526	9/19/84												●											
725	9/19/84																							
547	9/19/84																						●	●
933	9/19/84												●											
588	9/19/84												●											
594	9/19/84																							●
879	9/19/84																						●	
866	9/19/84												●	●										
631	9/19/84																							
635	9/19/84																							
773	9/19/84 (S)																						●	
662	9/19/84												●											●
672	9/19/84													●										
387	9/24/84 (S)							●																
360	9/25/84 (S)																							
420	9/26/84 (S)																							
	Total	-	-	-	1	-	-	3	2	-	-	-	17	6	-	-	-	1	-	-	1	-	4	14

		WEEK OF DEATH																																																					
Animal Number (Prefix Ax)	Date of Death	1-52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106
372	8/9/83	● (47)																																																					
564	1/13/84																		●																																					
576	2/1/84																					●																																		
760	2/2/84																					●																																		
842	2/7/84																						●																																	
516	2/16/84																							●																																
503	3/6/84																										●																													
570	3/28/84																													●																										
653	4/1/84																													●																										
362	4/10/84																															●																								
401	4/16/84																																●																							
853	4/23/84																																	●																						
783	6/7/84																																							●																
934	6/27/84																																										●													
726	6/27/84																																										●													
817	6/29/84																																										●													
535	7/6/84																																											●												
645	8/10/84																																																●							
344	9/18/84																																																						●	
898	9/18/84																																																						●	
692	9/18/84																																																						●	
385	9/18/84																																																						●	
932	9/18/84 (S)																																																						●	
403	9/18/84																																																						●	
407	9/18/84																																																						●	
899	9/18/84																																																						●	
950	9/18/84																																																						●	
484	9/18/84																																																						●	
946	9/18/84																																																						●	
497	9/18/84																																																						●	
456	9/19/84																																																						●	
468	9/19/84																																																						●	
470	9/19/84																																																						●	
498	9/19/84																																																						●	
526	9/19/84																																																						●	
725	9/19/84																																																						●	
547	9/19/84																																																						●	
933	9/19/84																																																						●	
588	9/19/84																																																						●	
594	9/19/84																																																						●	
879	9/19/84																																																						●	
866	9/19/84																																																						●	
631	9/19/84																																																						●	
635	9/19/84																																																						●	
773	9/19/84 (S)																																																						●	
662	9/19/84																																																						●	
672	9/19/84																																																						●	
387	9/24/84 (S)																																																							●
360	9/25/84 (S)																																																							●
420	9/26/84 (S)																																																							●
	Total																																																							

[1] Tissue lesion, i.e., enlarged, discolored, irregular, etc.

(S) = Special Study Animals (Metabolism, Disposition and Binding Studies)

TABLE 12K

SUMMARY OF NECROPSY OBSERVATIONS IN FEMALE RATS (EDC/DS GROUP)

Dose Group: EDC/DS
Sex: Female

Animal Number (Prefix Ax)	Date of Death	TISSUE LESIONS 1/																			TISSUE MASSES																						
		Adrenals	Bladder	Brain	Clitoral Glands	Heart	Kidneys	Liver	Lungs	Lymph Nodes, Mandibular	Lymph Nodes, Mesenteric	Pancreas	Pituitary	Preputial Glands	Prostate	Seminal Vesicles	Spleen	Testes	Vagina	Other	Adrenals	Bladder	Brain	Cecum	Colon	Jejunum	Kidnesy	Liver	Lungs	Lymph Nodes, Mandibular	Lymph Nodes, Mesenteric	Mammary	Ovary	Pancreas	Preputial Glands	Salivary Glands	Skin	Small Intestines	Spleen	Stomach	Thymus	Uterus	Other
462	9/6/83												●																														
743	11/21/83												●																														
529	12/7/83												●						●	●																							
426	12/14/83												●																														
515	2/1/84																															●											●
754	2/1/84	●					●		●	●			●															●															●
661	2/1/84	●					●		●	●			●				●			●												●											●
695	2/13/84	●											●							●								●															
506	2/29/84						●			●	●									●																							
909	2/29/84										●									●																							●
472	3/7/84	●				●					●	●					●			●								●					●						●				
437	4/17/84	●								●	●		●																			●											
417	4/24/84							●		●	●		●				●															●											
499	4/27/84												●																														
534	4/27/84										●		●				●															●											
542	5/2/84				●								●																●			●											
803	6/6/84	●											●							●								●					●									●	●
471	6/21/84	●											●															●					●										●
930	6/26/84							●									●											●					●										●
530	7/3/84						●	●	●				●				●			●								●				●											●
580	7/9/84								●				●							●																							●
799	7/18/84						●	●					●				●			●												●	●										
427	7/18/84	●	●					●					●																			●											
509	8/3/84							●												●								●														●	●
616	8/13/84						●	●		●							●			●																							
931	8/31/84		●			●	●	●	●	●			●				●			●								●					●										
531	9/10/84	●						●		●										●																							●
753	9/10/84	●											●																				●										●
758	9/17/84	●											●															●					●									●	●
859	9/17/84												●															●					●										●
742	9/17/84								●																																	●	
397	9/17/84							●		●			●				●			●								●														●	●
408	9/17/84	●							●		●																	●														●	
421	9/17/84												●															●															●
694	9/17/84	●								●			●															●															●
816	9/19/84	●																		●								●				●										●	
519	9/19/84									●	●																	●					●										●
822	9/19/84												●															●															●
551	9/19/84	●											●							●								●				●											
558	9/19/84							●					●							●												●											
569	9/19/84								●											●													●										●
585	9/19/84							●					●							●								●															●
593	9/19/84							●			●		●															●				●	●										
613	9/19/84	●											●																														
860	9/19/84							●					●															●				●	●	●								●	
943	9/19/84	●							●				●							●								●									●					●	●
467	9/20/84							●					●																														
405	9/24/84 (S)												●														●						●										
877	9/25/84 (S)												●							●																							
466	9/26/84 (S)						●						●							●																						●	
	Total	17	2	-	1	2	8	15	9	11	9	1	37	-	-	-	10	-	1	23	-	-	-	-	-	-	1	23	1	-	-	14	14	1	-	-	1	-	1	-	-	10	22

Animal Number (Prefix Ax)	WEEK OF DEATH																																																					
	1-52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106
462	● (5)																																																					
743											●																																												
529													●																																										
426														●																																									
515																					●																																		
754																					●																																		
661																					●																																		
695																							●																																
506																									●																														
909																									●																														
472																										●																													
437																																●																							
417																																	●																						
499																																	●																						
534																																	●																						
542																																		●																					
803																																							●																
471																																									●														
930																																										●													
530																																											●												
580																																												●											
799																																													●										
427																																													●										
509																																															●								
616																																																	●						
931																																																			●				
531																																																					●		
753																																																					●		
758																																																						●	
859																																																						●	
742																																																						●	
397																																																						●	
408																																																						●	
421																																																						●	
694																																																						●	
816																																																						●	
519																																																						●	
822																																																						●	
551																																																						●	
558																																																						●	
569																																																						●	
585																																																						●	
593																																																						●	
613																																																						●	
860																																																						●	
943																																																						●	
467																																																						●	
405																																																							●
877																																																							●
466																																																							●

1/ Tissue lesions, i.e., enlarged, discolored irregular, etc

(S) = Special Study Animals (Metabolism, Disposition and Binding Studies)

TABLE 12L

SUMMARY OF NECROPSY OBSERVATIONS IN FEMALE RATS (EDC/ET GROUP)

Dose Group: EDC/ET
Sex: Female

		TISSUE LESIONS 1/																		
Animal Number (Prefix Ax)	Date of Death	Adrenals	Bladder	Brain	Clitoral Glands	Heart	Kidneys	Liver	Lungs	Lymph Nodes, Mandibular	Lymph Nodes, Mesenteric	Pancreas	Pituitary	Preputial Glands	Prostate	Seminal Vesicles	Spleen	Testes	Vagina	Other
746	10/15/82		●				●													
359	8/22/83												●							
469	11/23/83									●			●							
478	11/29/83							●					●							
900	2/1/84												●							
598	3/7/84	●		●									●							
504	3/14/84												●							●
475	3/30/84					●							●							
626	4/12/84												●							
363	5/15/84	●											●							
358	5/17/84												●							
624	5/17/84							●					●							
674	5/24/84												●							
659	6/1/84												●							
492	6/6/84												●							
664	6/7/84												●							
419	6/7/84							●					●							
510	6/13/84						●	●					●							●
868	6/19/84							●					●							●
369	6/29/84	●					●	●					●							●
562	6/29/84							●					●							●
880	7/6/84	●					●	●					●							
942	8/1/84						●	●					●							
627	8/8/84							●					●							●
663	8/21/84							●	●				●							●
806	8/29/84	●															●			●
483	9/9/84						●						●							
563	9/16/84												●							
388	9/18/84 (S)												●							●
956	9/18/84												●							●
901	9/18/84	●						●												
410	9/18/84												●							●
935	9/18/84	●											●							●
412	9/18/84							●	●	●										
446	9/19/84	●						●												
454	9/10/84	●											●							
458	9/19/84																			●
481	9/19/84							●					●							
487	9/19/84	●											●							
823	9/19/84												●							
949	9/19/84								●											
544	9/19/84	●						●					●							●
560	9/20/84	●					●						●							●
572	9/20/84						●				●		●							
729	9/20/84																			
621	9/20/84	●							●	●			●							
869	9/20/84 (S)							●					●							
409	9/24/84 (S)																			
818	9/25/84 (S)	●								●			●							●
669	9/26/84 (S)												●							
Total		14	1	1	-	1	8	17	4	4	1	-	41	-	-	-	1	-	-	16

		TISSUE MASSES																						
Animal Number (Prefix Ax)	Date of Death	Adrenals	Bladder	Brain	Cecum	Colon	Jejunum	Kidneys	Liver	Lungs	Lymph Nodes, Mandibular	Lymph Nodes, Mesenteric	Mammar.	Ovary	Pancreas	Preputial Glands	Salivary Glands	Skin	Small Intestines	Spleen	Stomach	Thymus	Uterus	Other
746	10/15/82																							
359	8/22/83																							
469	11/23/83																							
478	11/29/83																							
900	2/1/84												●											
598	3/7/84												●											
504	3/14/84												●											●
475	3/30/84																					●		
626	4/12/84																							
363	5/15/84							●					●											
358	5/17/84																							
624	5/17/84												●											●
674	5/24/84																							
659	6/1/84																							●
492	6/6/84																							
664	6/7/84												●											●
419	6/7/84																						●	
510	6/13/84							●																
868	6/19/84																							●
369	6/29/84																							●
562	6/29/84																							
880	7/6/84												●											
942	8/1/84																							
627	8/8/84																							
663	8/21/84							●																●
806	8/29/84																							●
483	9/9/84																							●
563	9/16/84																							
388	9/18/84 (S)																			●				●
956	9/18/84																							●
901	9/18/84																							●
410	9/18/84																							
935	9/18/84																							
412	9/18/84																						●	●
446	9/19/84												●											
454	9/10/84																							●
458	9/19/84																							
481	9/19/84																							
487	9/19/84																							●
823	9/19/84												●											
949	9/19/84																							
544	9/19/84																							●
560	9/20/84																							●
572	9/20/84				●			●		●			●											
729	9/20/84												●											
621	9/20/84																							●
869	9/20/84 (S)								●				●											
409	9/24/84 (S)																							
818	9/25/84 (S)																							
669	9/26/84 (S)																							●
Total		-	-	-	1	-	-	4	1	1	-	-	12	-	-	-	-	-	-	1	-	1	2	19

		WEEK OF DEATH																																																				
Animal Number (Prefix Ax)	Date of Death	1-52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106
746	10/15/82	● (4)																																																						
359	8/22/83	● (49)																																																						
469	11/23/83											●																																												
478	11/29/83												●																																											
900	2/1/84																					●																																		
598	3/7/84																										●																													
504	3/14/84																											●																												
475	3/30/84																													●																										
626	4/12/84																															●																								
363	5/15/84																																				●																			
358	5/17/84																																				●																			
624	5/17/84																																				●																			
674	5/24/84																																					●																		
659	6/1/84																																						●																	
492	6/6/84																																							●																
664	6/7/84																																							●																
419	6/7/84																																							●																
510	6/13/84																																								●															
868	6/19/84																																									●														
369	6/29/84																																										●													
562	6/29/84																																										●													
880	7/6/84																																											●												
942	8/1/84																																															●								
627	8/8/84																																																●							
663	8/21/84																																																		●					
806	8/29/84																																																			●				
483	9/9/84																																																				●			
563	9/16/84																																																					●		
388	9/18/84 (S)																																																						●	
956	9/18/84																																																						●	
901	9/18/84																																																						●	
410	9/18/84																																																						●	
935	9/18/84																																																						●	
412	9/18/84																																																						●	
446	9/19/84																																																						●	
454	9/10/84																																																						●	
458	9/19/84																																																						●	
481	9/19/84																																																						●	
487	9/19/84																																																						●	
823	9/19/84																																																						●	
949	9/19/84																																																						●	
544	9/19/84																																																						●	
560	9/20/84																																																						●	
572	9/20/84																																																						●	
729	9/20/84																																																						●	
621	9/20/84																																																						●	
869	9/20/84 (S)																																																						●	
409	9/24/84 (S)																																																							●
818	9/25/84 (S)																																																							●
669	9/26/84 (S)																																																							●
Total																																																								

1/ Tissue lesions, i.e., enlarged, discolored, irregular, etc.
(S) = Special Study Animals (Metabolism, Disposition and Binding Studies)

The absolute and relative organ weights are summarized in Table 13. There were no significant differences in absolute organ weights when the treated groups were compared to the control groups; however, the liver weight relative to body weight was significantly increased ($p \leqq 0.05$) in both male and female EDC/DS groups when compared to their control groups. This finding is consistent with a increased incidence of liver masses in EDC/DS male and female treatment groups when compared to the control groups.

F. Histopathology

See Appendix 9 for histopathology narrative and summary tables and a separate volume (Part I, Volume 2 of 2) for individual animal pathology data.

Table 14 highlights the incidence of selected primary tumors that were evaluated at the termination of study.

TABLE 13

ABSOLUTE AND RELATIVE ORGAN WEIGHTS OF RATS IN 1,2-DICHLOROETHANE STUDY

Sex	Dose Group	Terminal Body Weight (g)[a]	Absolute Mean Organ Weight (g) Liver	Absolute Mean Organ Weight (g) Gonad
Male	Control	607.9 ± 114.0(26)	22.00 ± 5.08(26)	3.23 ± 0.71(26)
	DS	605.8 ± 95.4(35)	23.61 ± 3.51(33)	3.61 ± 0.94(35)
	ET	624.0 ± 107.5(26)	23.36 ± 7.47(26)	3.69 ± 0.71(26)
	EDC	672.2 ± 121.5(26)	25.15 ± 5.30(26)	3.56 ± 2.03(25)
	EDC/DS	526.3 ± 61.8(22)[b]	24.32 ± 4.31(22)	3.53 ± 1.01(22)
	EDC/ET	657.1 ± 105.0(26)	23.60 ± 4.58(26)	3.20 ± 0.77(26)
Female	Control	417.6 ± 93.6(27)	15.57 ± 3.45(27)	0.17 ± 0.11(27)
	DS	331.0 ± 63.0(33)	13.55 ± 2.99(33)	0.20 ± 0.18(33)
	ET	470.1 ± 117.6(27)	16.81 ± 4.60(27)	0.20 ± 0.26(27)
	EDC	441.6 ± 87.7(32)	16.53 ± 4.23(32)	0.19 ± 0.13(32)
	EDC/DS	348.5 ± 74.7(22)[b]	18.07 ± 5.24(22)	0.20 ± 0.11(21)
	EDC/ET	523.2 ± 155.4(22)	17.36 ± 5.50(22)	0.17 ± 0.09(22)

Sex	Dose Group	Relative Organ Weight (g/100 g Body Weight) Liver	Relative Organ Weight (g/100 g Body Weight) Gonad
Male	Control	3.69 ± 0.97(26)	0.53 ± 0.15(26)
	DS	3.89 ± 0.54(33)	0.59 ± 0.15(35)
	ET	3.74 ± 1.15(26)	0.60 ± 0.78(26)
	EDC	3.74 ± 0.83(26)	0.49 ± 0.16(25)
	EDC/DS	4.44 ± 1.09(22)[b]	0.68 ± 0.23(22)
	EDC/ET	3.64 ± 0.76(26)	0.47 ± 0.12(26)
Female	Control	3.79 ± 0.66(27)	0.041 ± 0.023(27)
	DS	4.11 ± 0.56(33)	0.056 ± 0.053(33)
	ET	3.65 ± 0.96(27)	0.035 ± 0.019(27)
	EDC	3.76 ± 0.69(32)	0.040 ± 0.018(32)
	EDC/DS	5.27 ± 1.49(22)[b]	0.051 ± 0.031(21)
	EDC/ET	3.41 ± 0.92(22)	0.034 ± 0.018(22)

---

[a] Mean ± S.D.(n).

[b] Significantly different from control, Dunnett's Multiple Comparison, $p \leq 0.05$ (from C. C. Liu, "Introduction to Experimental Statistics," McGraw-Hill, NY. 1964. 419-428).

TABLE 14

SUMMARY OF THE INCIDENCE OF SELECTED PRIMARY TUMORS IN RATS IN THE TWO-YEAR STUDY OF 1,2-DICHLOROETHANE

	Male					
	C	DS	ET	EDC	EDC/DS	EDC/ET
Intrahepatic Bile Duct: Cholangioma						
Overall Rates	0/50 (0%)	0/50 (0%)	0/50 (0%)	0/50 (0%)	9/49 (18.4%)	0/50 (0%)
Fisher Exact Test[a]					P = 0.001	
Liver: Neoplastic Nodules						
Overall Rates	0/50 (0%)	1/50 (2%)	2/50 (4%)	2/50 (4%)	6/49 (12.2%)	4/50 (8%)
Fisher Exact Test					P = 0.013	
Testes: Interstitial Cell Tumor						
Overall Rates	2/50 (4%)	3/50 (6%)	7/50 (14%)	3/50 (6%)	11/50 (22%)	5/50 (10%)
Fisher Exact Test					P = 0.015	
Subcutis: Fibroma						
Overall Rates	2/50 (4%)	1/50 (2%)	0/49 (0%)	3/50 (6%)	10/50 (20%)	2/50 (4%)
Fisher Exact Test					P = 0.028	

	Female					
	C	DS	ET	EDC	EDC/DS	EDC/ET
Intrahepatic Bile Duct: Cholangioma						
Overall Rates	0/50 (0%)	0/49 (0%)	0/49 (0%)	0/50 (0%)	17/50 (34%)	0/50 (0%)
Fisher Exact Test					P < 0.001	
Mammary Gland: Adenocarcinoma						
Overall Rates	4/50 (8%)	2/46 (4.3%)	6/45 (13.3%)	5/50 (10%)	12/48 (25%)	2/47 (4.3%)
Fisher Exact Test					P = 0.029	

---

[a] P-values are for the comparison of the treated group to the control group. All P values, except those stated above, were greater than 0.05. See Statistical Methods in Medical Research. New York: John Wiley & Sons, Inc. (1971).

IV. DISCUSSION - SUMMARY

Sprague-Dawley rats (50/sex/group) were exposed to 50 ppm 1,2-dichloroethane 7 hr/day, 5 days/week, for 24 months with or without disulfiram in the diet, and with or without ethanol in the drinking water. During the course of this study, animals were periodically observed for clinical signs of toxicity, weighed to determine growth characteristics, palpated for tissue masses incidence, and food and water consumption determined as toxicological parameters. At the completion of the study, complete tissue histopathology was performed on all animals. In addition, animals from this chronic study were selected for metabolism, disposition, and DNA binding studies (Special Studies Program). Additional information on the experimental design and material and methods are detailed in Table 6.

During the course of this study, less body weight gains were noted in both male and female animals in dose groups treated with dietary disulfiram (i.e., DS group and EDC/DS group). This finding of decreased weight gains is consistent with other chronic studies previously performed with disulfiram (National Cancer Institute, "Bioassay of Tetraethylthiruram," 1979, and Midwest Research Institute, "Chronic Inhalation Toxicity of 1,2-Dibromoethane in Rats," 1980). On the other hand, no noteworthy changes were recorded in clinical signs of toxicity, on survival rate, or on food and water consumption parameters during the course of this study. An increased incidence of tissue lesions or masses were noted in several treatment groups at necropsy, an increased incidence of liver masses in both male and female EDC/DS groups, an increased incidence of kidney lesions in the male EDC/ET group, and an increased incidence of testicular lesions in the male EDC treatment group. The significance of these necropsy observations correlates with some of the findings from the histopathological evaluation, namely, the lesions of the testes and the liver. The liver as a target organ of potential EDC/DS toxicity is consistent with other chronic studies of the synergistic effects of 1,2-dihaloethanes and pharmacologic agents (i.e., 1,2-dibromoethane and disulfiram). In previous studies with 1,2-dibromoethane and disulfiram, the toxicity and carcinogenicity of the test chemical were increased in the presence of the pharmacologic agent.

In this study, the EDC/DS combination treatment should be considered carcinogenic for the liver as there was a high incidence of intrahepatic bile duct cholangiomas in both male and female rats and neoplastic nodules (hepatocellular adenomas) in male rats utilizing this dosing regimen. Interstitial cell tumors of the testes and fibromas of the subcutis were also significantly increased in male rats. The increased incidence of adenocarcinomas of the mammary gland in female rats is also considered a marginal carcinogenic effect (see Appendix 9).

A summary of pertinent findings for this chronic study is presented below:

Parameters	Male Rats	Female Rats
Body weights: (growth)	↓ weight gains in DS and EDC/DS groups (entire study)	↓ weight gains in DS and EDC/DS groups (entire study)
Food and water consumption:	NNF	NNF
Clinical signs:	NNF	NNF
Survival:	NNF	NNF
Organ weights:	↑ in relative liver weights in EDC/DS group	↑ in relative liver weight in EDC/DS group
Gross lesions: (necropsy)	↑ liver masses in EDC/DS group	↑ liver masses in EDC/DS group
	↑ kidney lesions in EDC/ET group	-
	↑ testicular lesions in all EDC groups	-
Histopathology:	↑ cholangiomas of intrahepatic bile duct in EDC/DS group	↑ cholangiomas of intrahepatic bile duct in EDC/DS group
	↑ neoplastic nodules of liver (hepatocellular adenoma) in EDC/DS group	↑ adenocarcinomas of mammary gland in EDC/DS group
	↑ fibromas of subcutis in EDC/DS group	↑ fibromas of subcutis in EDC/DS group
	↑ interstitial cell tumors of testes in EDC/DS group	

↑/↓ = increase/decrease.
NNF = no noteworthy findings

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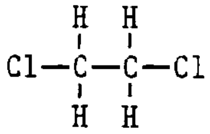
APPENDIX 1

BULK CHEMICAL ANALYSES REPORTS
(1,2-DICHLOROETHANE)

Lot No. 2403TH, 9/1/82
Lot No. 2403TH, 9/1/82 (revised 12/20/82)
Lot No. 2403TH, 12/20/82
Lot No. 5027EJ, 12/20/82
Lot No. 5027EJ, 4/27/83
Lot No. 5027EJ, 8/25/83
Lot No. 1420TJ, 10/7/83
Lot No. 5027EJ, 1/4/84
Lot No. 1420TJ, 5/4/84
Lot No. 2401HL, 8/14/84

MIDWEST RESEARCH INSTITUTE
NIOSH CONTRACT NO. 200-82-2508
MRI Project No. 7452-B
September 1, 1982

COMPOUND: 1,2-Dichloroethane



$$Cl-\underset{H}{\overset{H}{C}}-\underset{H}{\overset{H}{C}}-Cl$$

$C_2H_4Cl_2$
M.W. 187.88

Lot No.: 2403TH

I. LIMITED BULK CHEMICAL CHARACTERIZATION

A. HOMOGENIZATION

The sample was received in a 1-liter glass bottle and was mixed by manually shaking and inverting the bottle for ∿ 5 min.

B. REANALYSIS SAMPLE STORAGE

Five-milliliter aliquots were transferred by pipet to 8 x 5-ml amber septum vials which had been purged with nitrogen. A nitrogen headspace was placed over each sample, and the vials were sealed with Teflon®-lined septa and aluminum seals. The samples were stored at -20°C.

C. ANALYSIS

1. INFRARED SPECTROSCOPY

Instrument: Perkin-Elmer 283
Cell: Thin film between silver chloride plates
Results: See attached spectrum (Figure 1)

Spectrum consistent with structure and literature reference.[1]

2. GAS CHROMATOGRAPHY

Instrument: Varian 3700
Detector: Flame ionization
Inlet Temperature: 200°C
Detector Temperature: 250°C

---

[1] Sadtler Standard Spectra, Sadtler Research Laboratories, Philadelphia, Pennsylvania, IR No. 35.

Carrier Gas: Nitrogen
Carrier Flow Rate: 70 cc/min
Column: 80/100 Carbopack C/0.1% SP-1000, 1.8 m x 4 mm ID, glass
Oven Temperature Program: 50°C for 5 min, then 50 to 200°C at 10°/min
Samples Injected: Neat liquid (4 μl); 1.0% and 0.5% solutions of 1,2-dichloroethane in methylene chloride to quantitate the major peak and check for detector overloading.

Results: Major peak only, with no impurities observed having areas of 0.1% or greater relative to the major peak. Three impurities were observed with areas less than 0.1%, two before and one after the major peak (see Figure 2).

Peak No.	Retention Time (min)	Retention Time (Relative to Major Peak)	Area (% of Major Peak Area)
1	6.2	1.00	100

3. CONCLUSION

The sample was identified as 1,2-dichloroethane by infrared spectroscopy. Gas chromatographic analysis detected no impurities 0.1% or greater, relative to the major peak, indicating a purity > 99%.

II. CHEMICAL ANALYSIS PROTOCOL FOR THE BIOASSAYER

A. GENERAL PROTOCOL

The objective is to determine whether a given compound as received and stored is, and remains, identical to that received and analyzed by MRI.

The most efficient method for determining stability is to maintain a stable standard for comparison with the stored bulk chemical. Therefore, when you receive the bulk shipment, remove standard samples of 5 ml for each testing time.

Place each sample in a glass vial, under a nitrogen headspace, with a Teflon®-lined top, tightly closed and, if possible, sealed. Place samples in a freezer at -20°C for storage prior to analysis.

Remove a single vial of standard from the freezer approximately 4 hr prior to analysis. Obtain a sample of the stored bulk chemical. Analyze the two samples in tandem, so that test results for the bulk chemical and the standard can be directly compared. Also compare your test results to those given in the MRI analytical reports. Your analytical results may differ slightly from those reported by MRI. However, your standard and sample analyses should be identical to each other and identical to MRI data within expected variation limits.

B. PURITY ANALYSIS BY GAS CHROMATOGRAPHIC MAJOR PEAK COMPARISON

1. PROCEDURE

Prepare the internal standard and duplicate samples of the test material and the reference sample in the following manner:

a. Prepare a solution of tetrahydrofuran (THF), the internal standard, by delivering about 4.2 ml of THF to a 200-ml volumetric flask and diluting to volume with ACS reagent grade methylene chloride. Shake well prior to use.

b. Using a volumetric pipet, deliver 1 ml of the test or reference 1,2-dichloroethane sample to a 200-ml volumetric flask containing about 100 ml of ACS reagent grade methylene chloride.

c. Add 20 ml of the internal standard solution to the flask containing 1,2-dichloroethane, using a volumetric pipet. Dilute to volume with methylene chloride and shake well to mix.

d. Prepare a blank solution by pipeting 20 ml of the internal standard solution into a 200-ml volumetric flask and diluting to volume with methanol.

e. Make at least duplicate injections (~ 3 µl) for each solution. Use sufficient attenuation to produce peaks having at least half-scale deflection. Use the following GC system as nearly as practicable, adjusting the oven temperature if necessary to obtain retention times close to those reported by MRI.

Instrument: Varian 3700 with autoinjector and CDS-111 integrator
Detector: Flame ionization
Inlet Temperature: 200°C
Detector Temperature: 250°C
Carrier Gas: Nitrogen
Carrier Flow Rate: 70 cc/min
Column: 80/100 Carbopack C/0.1% SP-1000, 1.8 m x 4 mm ID, glass
Oven Temperature Program: 55°C, isothermal
Retention Times: Tetrahydrofuran (Internal Standard) - 3.2 min
1,2-Dichloroethane - 5.2 min

2. CALCULATIONS

a. Determine peak areas of 1,2-dichloroethane and the internal standard.

b. Calculate a RRF (relative response factor) for each test and reference sample injection as follows:

$$\text{RRF} = \frac{\text{Peak Area Sample}}{\text{Peak Area Internal Standard x Weight Sample}^{*}}$$

c. Determine the relative purity of the test material by comparison of RRF values, using the formula:

$$\text{Relative purity (\%)} = \frac{\overline{\text{RRF}}\text{ Test Compound}}{\overline{\text{RRF}}\text{ Reference Material}} \text{ x } 100$$

d. Use chromatograms of the blank solution to determine that there are no interfering peaks under the sample peak. Also note and report any impurities detected for the test compound during the analysis.

III. CONTRIBUTORS

Roger Bardsley performed the analysis of 1,2-dichloroethane.

Chemical Characterization

Linda Siemann
Linda Siemann
Assistant Chemist

Richard D Brown
Richard D. Brown
Associate Chemist

Approved:

Evelyn Murrill
Evelyn Murrill, Ph.D.
Senior Advisor for Chemistry
and Biology

E. J. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry Section

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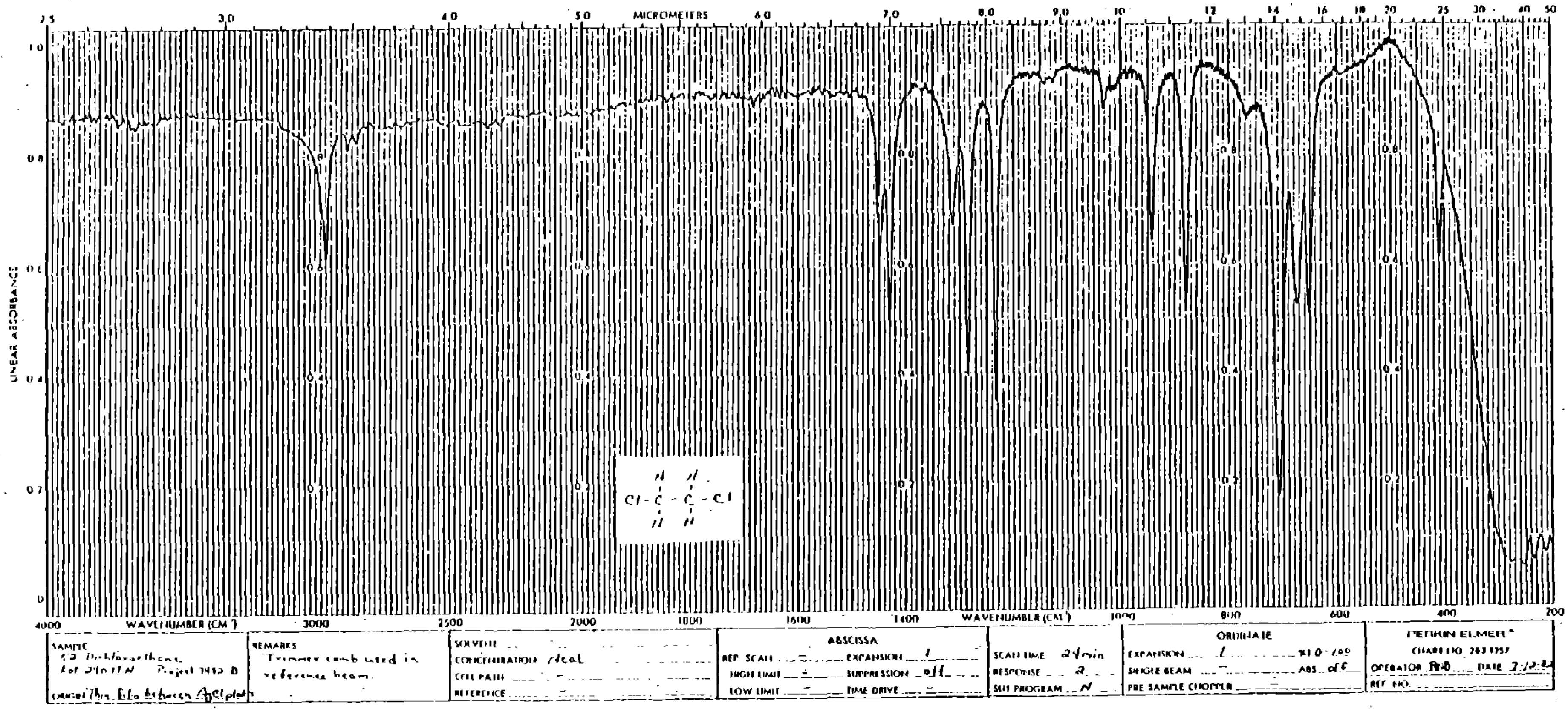
* Since the same volume of compound is contained in each sample tested, a value of one (1) is used for "weight sample."



SAMPLE 1,2 Dichloroethane
Lot [illegible] Project [illegible]
[illegible]

REMARKS Trimmer comb used in reference beam.

SOLVENT —
CONCENTRATION Neat
CELL PATH —
REFERENCE —

ABSCISSA
REF. SCALE — EXPANSION 1
HIGH LIMIT — SUPPRESSION off
LOW LIMIT — TIME DRIVE —

SCAN TIME 24 min
RESPONSE 2
SLIT PROGRAM N

ORDINATE
EXPANSION 1 %T 0-100
SINGLE BEAM — ABS. off
PRE SAMPLE CHOPPER —

PERKIN ELMER®
CHART NO. 283 1757
OPERATOR RWB DATE 7/12/[illegible]
REF. NO.

Figure 1 - Infrared Spectrum of 1,2-Dichloroethane

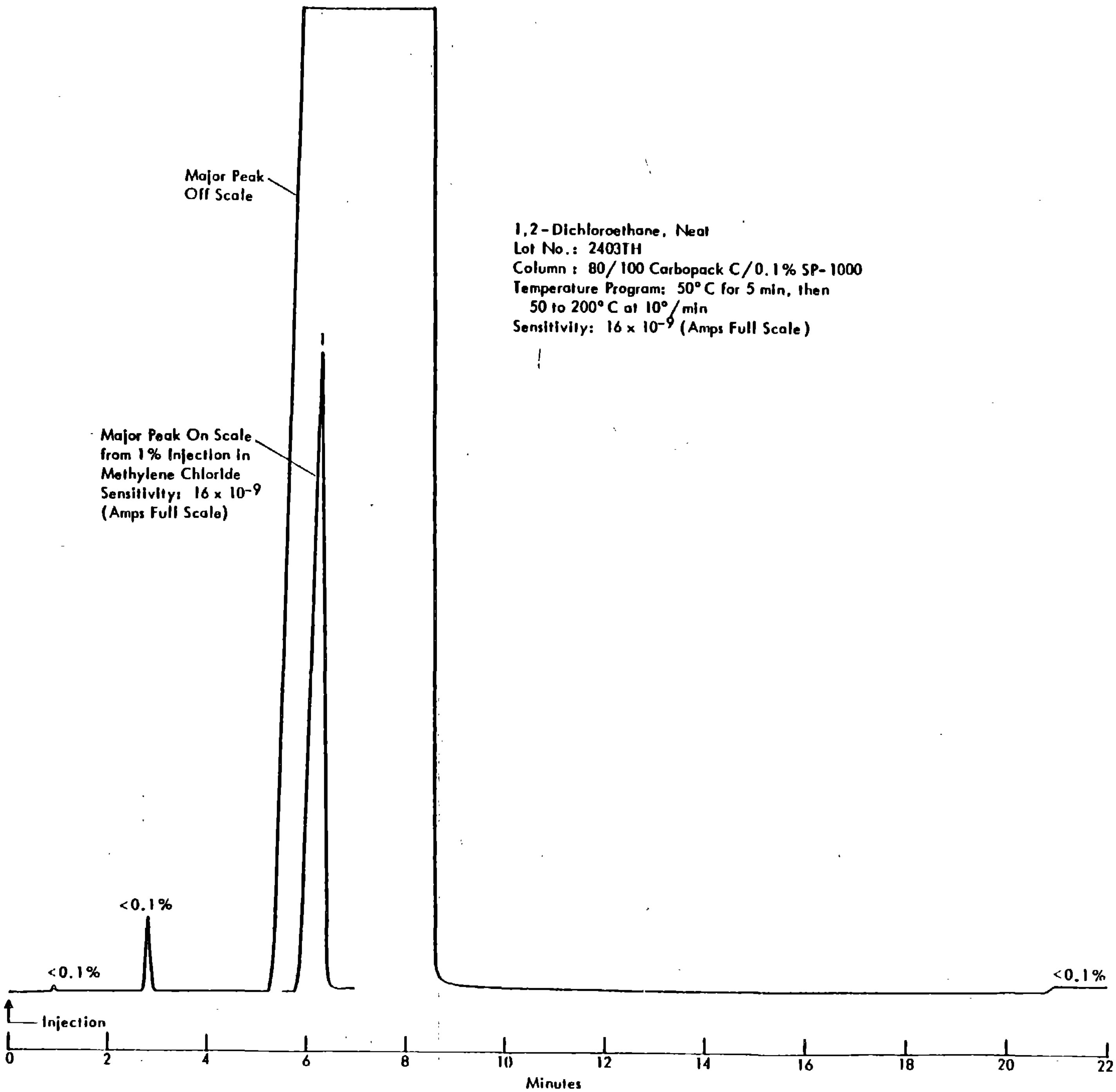
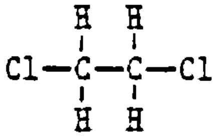


Figure 2 - Gas Chromatographic Profile of 1,2-Dichloroethane

MIDWEST RESEARCH INSTITUTE
NIOSH CONTRACT NO. 200-82-2508
MRI Project No. 7452-B
December 20, 1982
Revised Report*

COMPOUND: 1,2-Dichloroethane



$$Cl-\overset{H}{\underset{H}{C}}-\overset{H}{\underset{H}{C}}-Cl$$

$C_2H_4Cl_2$
M.W. 187.88

Lot No.: 2403TH

I. LIMITED BULK CHEMICAL CHARACTERIZATION

A. HOMOGENIZATION

The sample was received in a 1-liter glass bottle and was mixed by manually shaking and inverting the bottle for ~ 5 min.

B. REANALYSIS SAMPLE STORAGE

Five-milliliter aliquots were transferred by pipet to 8 x 5-ml amber septum vials which had been purged with nitrogen. A nitrogen headspace was placed over each sample, and the vials were sealed with Teflon®-lined septa and aluminum seals. The samples were stored at -20°C.

C. ANALYSIS

1. INFRARED SPECTROSCOPY

Instrument: Perkin-Elmer 283
Cell: Thin film between silver chloride plates
Results: See attached spectrum (Figure 1)

Spectrum consistent with structure and literature reference.[1]

2. GAS CHROMATOGRAPHY

Instrument: Varian 3700
Detector: Flame ionization
Inlet Temperature: 200°C
Detector Temperature: 250°C

---

[1] Sadtler Standard Spectra, Sadtler Research Laboratories, Philadelphia, Pennsylvania, IR No. 35.

* This is a revision of the report dated 9/1/82.

Carrier Gas: Nitrogen
Carrier Flow Rate: 70 cc/min
Column: 80/100 Carbopack C/0.1% SP-1000, 1.8 m x 4 mm ID, glass
Oven Temperature Program: 50°C for 5 min, then 50 to 200°C at 10°/min
Samples Injected: Neat liquid (4 µl); 1.0% and 0.5% solutions of 1,2-dichloroethane in methylene chloride to quantitate the major peak and check for detector overloading.

Results: Major peak only, with no impurities observed having areas of 0.1% or greater relative to the major peak. Three impurities were observed with areas less than 0.1%, two before and one after the major peak (see Figure 2).

Peak No.	Retention Time (min)	Retention Time (Relative to Major Peak)	Area (% of Major Peak Area)
1	6.2	1.00	100

3. CONCLUSION

The sample was identified as 1,2-dichloroethane by infrared spectroscopy. Gas chromatographic analysis detected no impurities 0.1% or greater, relative to the major peak, indicating a purity > 99%.

II. CHEMICAL ANALYSIS PROTOCOL FOR THE BIOASSAYER

A. GENERAL PROTOCOL

The objective is to determine whether a given compound as received and stored is, and remains, identical to that received and analyzed by MRI.

The most efficient method for determining stability is to maintain a stable standard for comparison with the stored bulk chemical. Therefore, when you receive the bulk shipment, remove standard samples of 5 ml for each testing time.

Place each sample in a glass vial, under a nitrogen headspace, with a Teflon®-lined top, tightly closed and, if possible, sealed. Place samples in a freezer at -20°C for storage prior to analysis.

Remove a single vial of standard from the freezer approximately 4 hr prior to analysis. Obtain a sample of the stored bulk chemical. Analyze the two samples in tandem, so that test results for the bulk chemical and the standard can be directly compared. Also compare your test results to those given in the MRI analytical reports. Your analytical results may differ slightly from those reported by MRI. However, your standard and sample analyses should be identical to each other and identical to MRI data within expected variation limits.

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b. Using a volumetric pipet, deliver 1 ml of the test or reference 1,2-dichloroethane sample to a 200-ml volumetric flask containing about 100 ml of ACS reagent grade methylene chloride.

c. Add 20 ml of the internal standard solution to the flask containing 1,2-dichloroethane, using a volumetric pipet. Dilute to volume with methylene chloride and shake well to mix.

d. Prepare a blank solution by pipeting 20 ml of the internal standard solution into a 200-ml volumetric flask and diluting to volume with methylene chloride.

e. Make at least duplicate injections (∿ 3 µl) for each solution. Use sufficient attenuation to produce peaks having at least half-scale deflection. Use the following GC system as nearly as practicable, adjusting the oven temperature if necessary to obtain retention times close to those reported by MRI.

Instrument: Varian 3700 with autoinjector and
  CDS-111 integrator
Detector: Flame ionization
Inlet Temperature: 200°C
Detector Temperature: 250°C
Carrier Gas: Nitrogen
Carrier Flow Rate: 70 cc/min
Column: 80/100 Carbopack C/0.1% SP-1000, 1.8 m x 4 mm ID,
  glass
Oven Temperature Program: 55°C, isothermal
Retention Times: Tetrahydrofuran (Internal Standard) - 3.2 min
  1,2-Dichloroethane - 5.2 min

2. CALCULATIONS

a. Determine peak areas of 1,2-dichloroethane and the internal standard.

b. Calculate a RRF (relative response factor) for each test and reference sample injection as follows:

$$\text{RRF} = \frac{\text{Peak Area Sample}}{\text{Peak Area Internal Standard x Weight Sample}^{*}}$$

c. Determine the relative purity of the test material by comparison of RRF values, using the formula:

$$\text{Relative purity (\%)} = \frac{\overline{\text{RRF}}\ \text{Test Compound}}{\overline{\text{RRF}}\ \text{Reference Material}} \text{ x } 100$$

d. Use chromatograms of the blank solution to determine that there are no interfering peaks under the sample peak. Also note and report any impurities detected for the test compound during the analysis.

III. CONTRIBUTORS

Roger Bardsley performed the analysis of 1,2-dichloroethane.

Chemical Characterization

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Approved:

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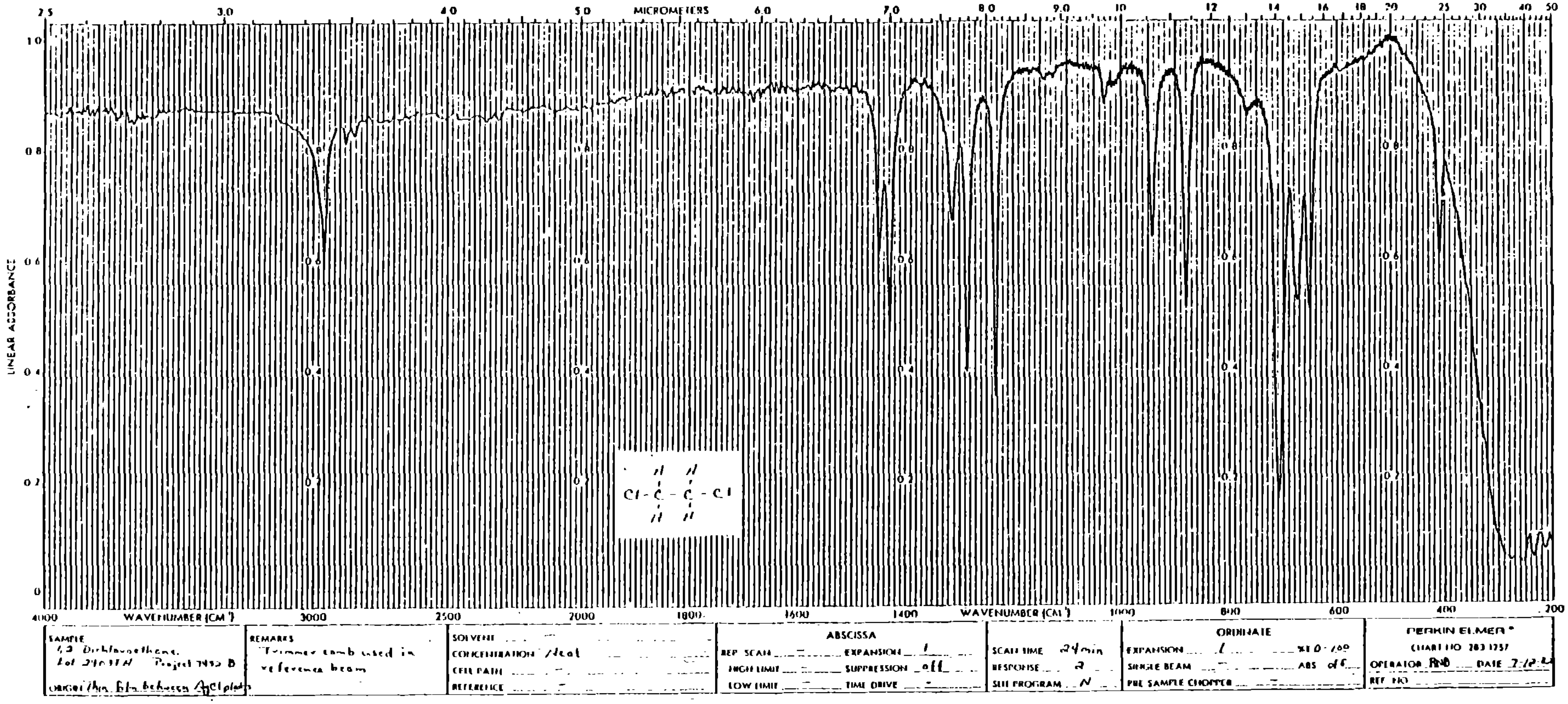
* Since the same volume of compound is contained in each sample tested, a value of one (1) is used for "weight sample."



SAMPLE 1,2 Dichloroethane. Lot 2101TH Project 7932 B

ORIGIN Thin film between AgCl plates

REMARKS "Trimmer comb used in reference beam

SOLVENT -

CONCENTRATION Neat

CELL PATH -

REFERENCE -

ABSCISSA

REF SCAN - EXPANSION 1

HIGH LIMIT - SUPPRESSION off

LOW LIMIT - TIME DRIVE -

SCAN TIME 24 min

RESPONSE 2

SLIT PROGRAM N

ORDINATE

EXPANSION 1 %T 0-100

SINGLE BEAM - ABS off

PRE SAMPLE CHOPPER -

OPERATOR RNB DATE 7-12-

REF NO

Figure 1 - Infrared Spectrum of 1,2-Dichloroethane

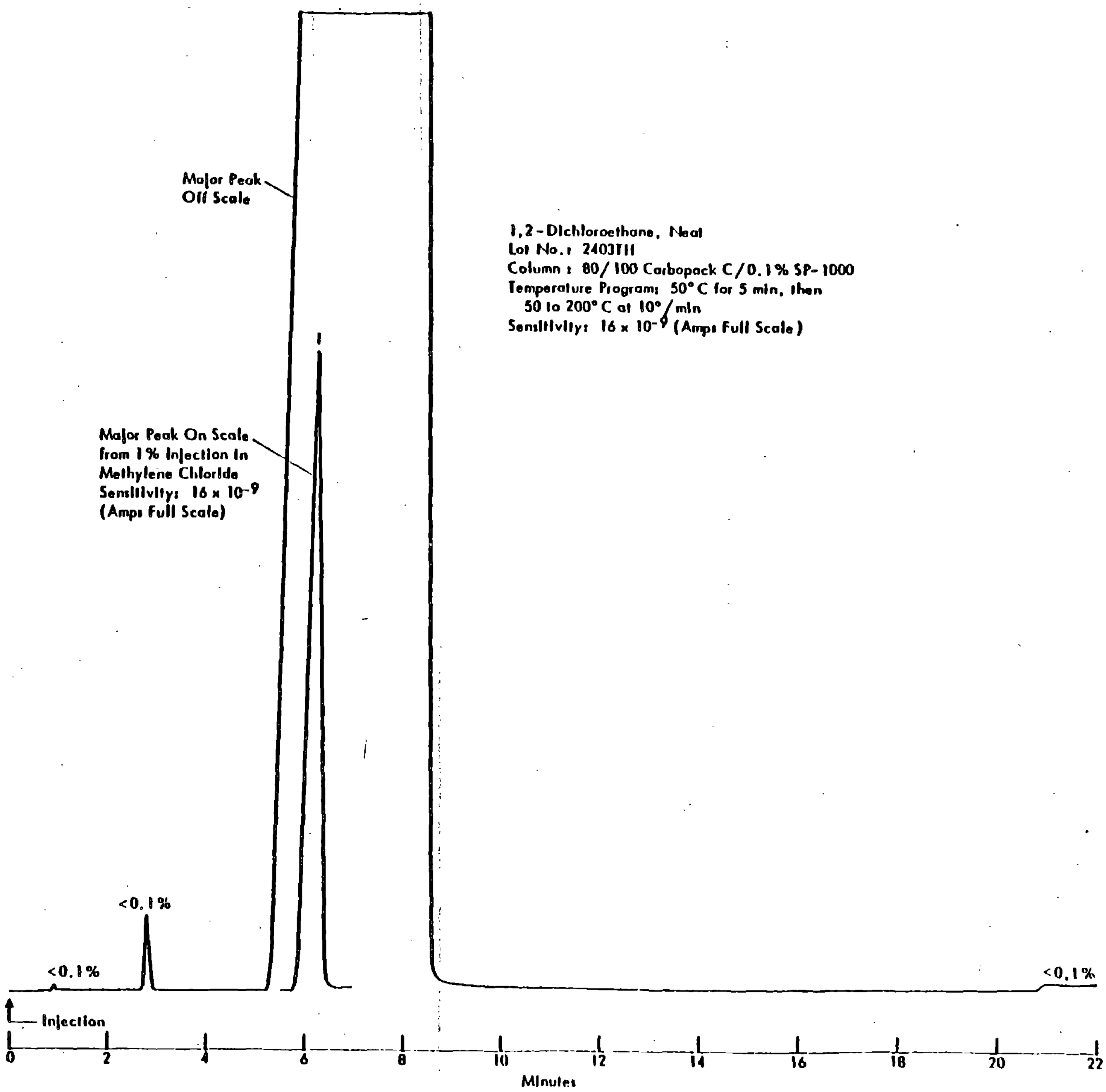


Figure 2 – Gas Chromatographic Profile of 1,2-Dichloroethane

Internal Analytical Report
Project No. 7452-B
December 20, 1982

REANALYSIS OF ETHYLENE DICHLORIDE (LOT NO. 2403 TH)

I. PURPOSE

To confirm the purity of the ethylene dichloride being used in the chronic inhalation study by comparison with a reference sample stored at -20°C.

II. ANALYSIS BY GAS CHROMATOGRAPHY

A. SYSTEM

Instrument: Varian 3700 gas chromatograph
Detector: Flame ionization
Column: 80/100 Carbopack C/0.1% SP-1000; 1.8 m x 4 mm ID; glass
Carrier Gas: Nitrogen
Carrier Gas Flow Rate: 70 cc/min
Detector Temperature: 250°C
Inlet Temperature: 200°C
Column Oven Temperature Program: 55°C, isothermal
Samples Injected: Solutions of 0.5% (v/v) ethylene dichloride in methylene chloride with ∿ 0.2% tetrahydrofuran as the internal standard
Retention Times: Ethylene dichloride - 6.4 min
Tetrahydrofuran - 4.0 min

B. METHOD

The bioassay and reference samples were analyzed on the gas chromatographic system given above. The ratio of the sample peak areas to the internal standard peak areas was obtained for the bioassay sample and then normalized to the average sample to internal standard ratio obtained for the reference sample.

C. RESULTS

The purity of the bioassay sample, relative to that of the reference sample, was found to be 100.5 ± 1.4(s)%.

III. CONCLUSIONS

The sample of the bioassay material was not found to be significantly different from the reference sample stored at -20°C at MRI.

This analysis was performed by the Bioanalytical Chemistry Section at Midwest Research Institute. Dr. Evelyn Murrill served as technical consultant for this analysis.

MIDWEST RESEARCH INSTITUTE

allan Chatham

Allan T. Chatham
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Approved:

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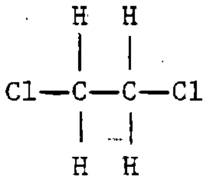
MIDWEST RESEARCH INSTITUTE
NIOSH CONTRACT NO. 200-82-2508
MRI Project No. 7452-B
Internal Analytical Report
December 20, 1982

COMPOUND: 1,2-Dichloroethane



$$\mathrm{Cl{-}\overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{C}}{-}\overset{\overset{\displaystyle H}{|}}{\underset{\underset{\displaystyle H}{|}}{C}}{-}Cl}$$

$C_2H_4Cl_2$ Lot No.: 5027 EJ

M.W. 187.88

I. LIMITED BULK CHEMICAL CHARACTERIZATION

A. HOMOGENIZATION

The sample was received in a 1-liter glass bottle and was mixed by manually shaking and inverting the bottle for ∿ 5 min.

B. REANALYSIS SAMPLE STORAGE

Five-milliliter aliquots were transferred by pipet to 8 x 5-ml amber septum vials which had been purged with nitrogen. A nitrogen headspace was placed over each sample, and the vials were sealed with Teflon® -lined septa and aluminum seals. The samples were stored at -20°C.

C. ANALYSIS

1. INFRARED SPECTROSCOPY

Instrument: Perkin-Elmer 283
Cell: Thin film between silver chloride plates
Results: See attached spectrum (Figure 1)

Spectrum consistent with structure and literature reference.[1]

---

[1] Sadtler Standard Spectra, Sadtler Research Laboratories, Philadelphia, Pennsylvania, IR No. 35.

2. GAS CHROMATOGRAPHY

Instrument: Varian 3700
Detector: Flame ionization
Inlet Temperature: 200°C
Detector Temperature: 250°C
Carrier Gas: Nitrogen
Carrier Flow Rate: 70 cc/min
Column: 80/100 Carbopack C/0.1% SP-1000, 1.8 m x 4 mm ID, glass
Oven Temperature Program: 50°C for 5 min, then 50 to 200°C at 10°/min
Samples Injected: Neat liquid (4 µl); 1.0% and 0.5% solutions of 1,2-dichloroethane in methylene chloride to quantitate the major peak and check for detector overloading.

Results: Major peak only, with no impurities observed having areas of 0.1% or greater relative to the major peak. Nine impurities were observed with areas less than 0.1%, five before and four after the major peak (see Figure 2).

Peak No.	Retention Time (min)	Retention Time (Relative to Major Peak)	Area (% of Major Peak Area)
1	7.3	1.00	100

3. CONCLUSION

The sample was identified as 1,2-dichloroethane by infrared spectroscopy. Gas chromatographic analysis detected no impurities 0.1% or greater, relative to the major peak, indicating a purity > 99%.

This analysis was conducted by the Bioanalytical Chemistry Section at Midwest Research Institute. Dr. Evelyn Murrill served as technical consultant for this analysis.

Approved:

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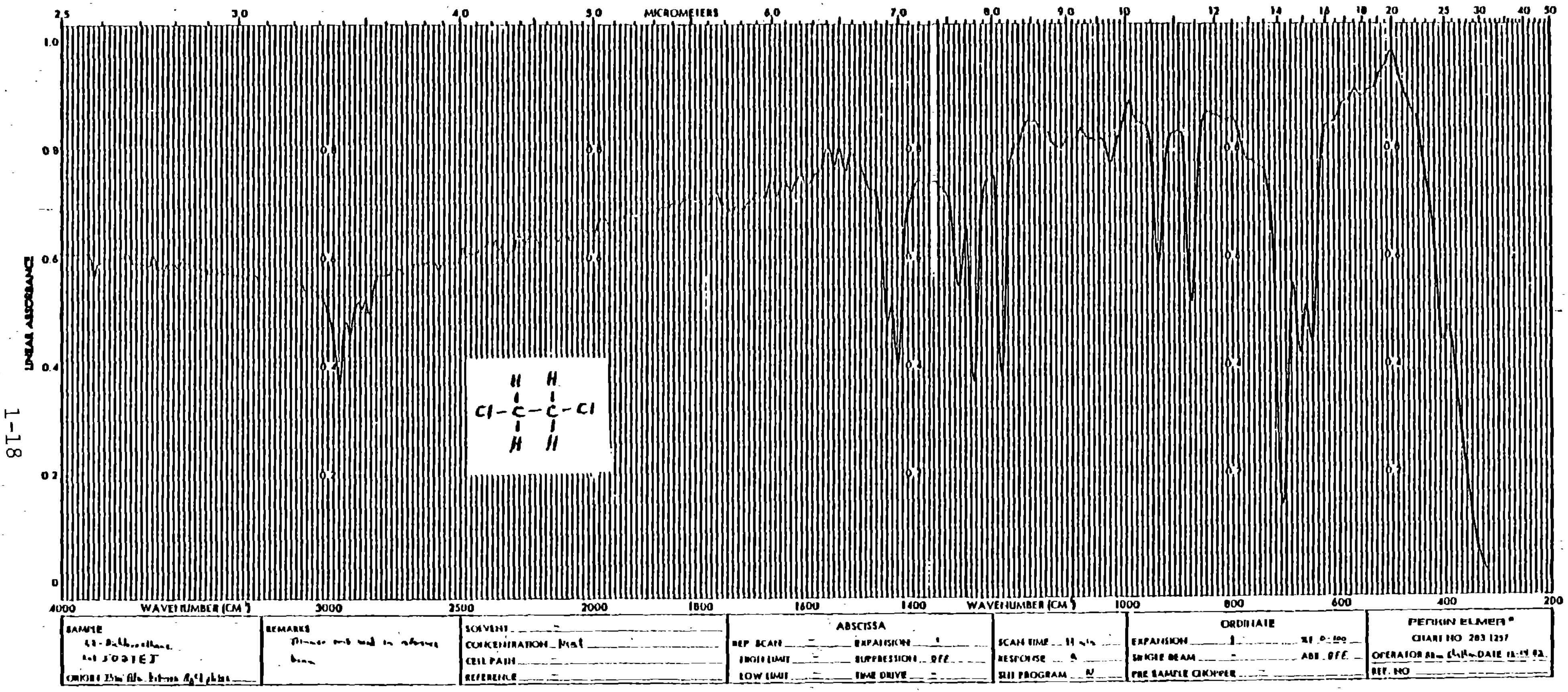

Figure 1 - Infrared Spectrum of 1,2-Dichloroethane

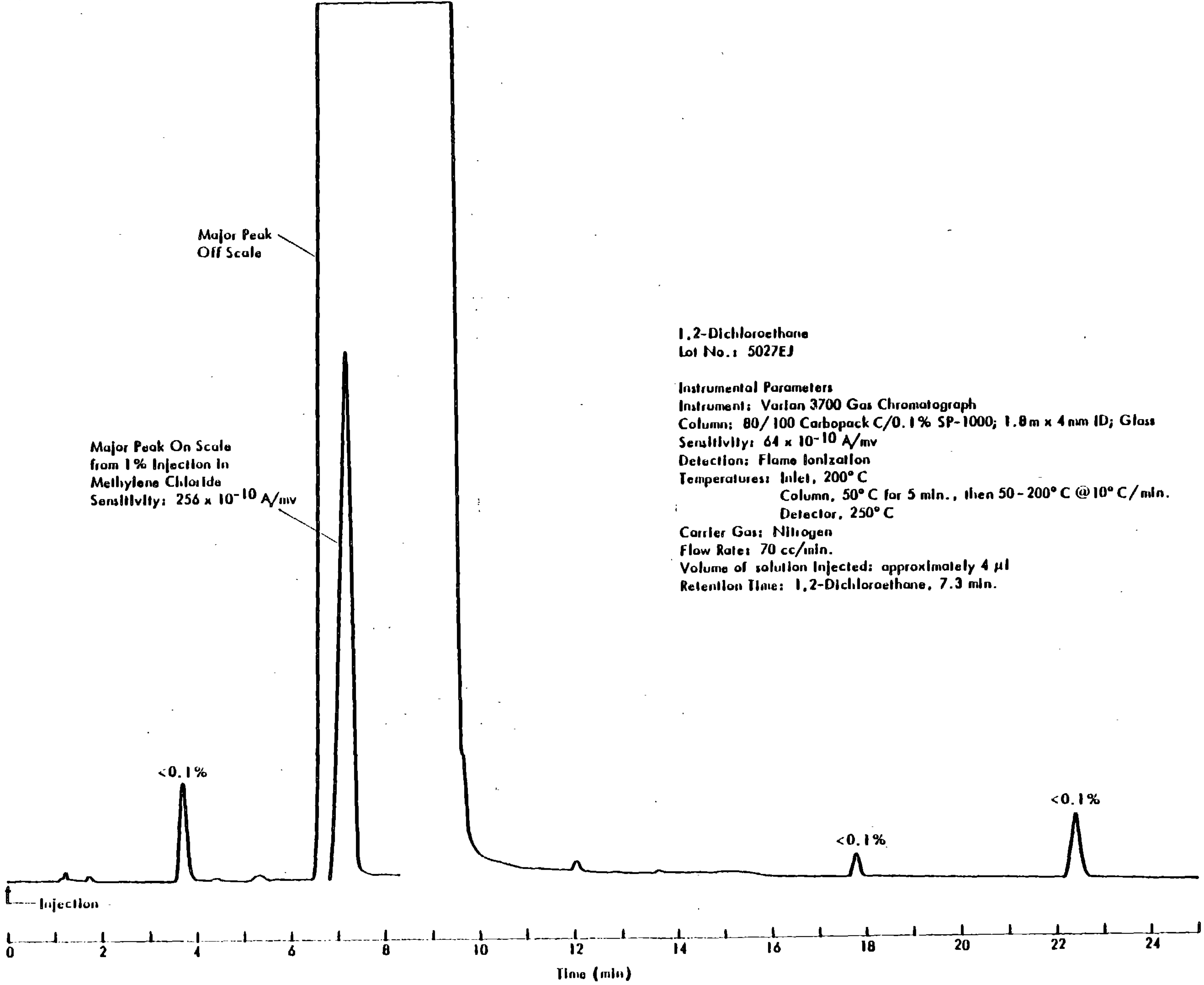

Figure 2 - Gas Chromatographic Profile of 1,2-Dichloroethane

Internal Analytical Report
MRI Project No. 7452-B
April 27, 1983

REANALYSIS OF ETHYLENE DICHLORIDE (LOT NO. 5027 EJ)

I. PURPOSE

To confirm the purity of the ethylene dichloride being used in the chronic inhalation study by comparison with a reference sample stored at -20°C.

II. ANALYSIS BY GAS CHROMATOGRAPHY

A. SYSTEM

Instrument: Varian 3700 gas chromatograph
Detector: Flame ionization
Column: 80/100 Carbopack C/0.1% SP-1000; 1.8 m x 4 mm ID; glass
Carrier Gas: Nitrogen
Carrier Gas Flow Rate: 70 cc/min
Detector Temperature: 250°C
Inlet Temperature: 200°C
Column Oven Temperature Program: 55°C, isothermal
Samples Injected: Solutions of 0.5% (v/v) ethylene dichloride in methylene chloride with ∿ 0.2% tetrahydrofuan as the internal standard
Retention Times: Ethylene dichloride - 6.0 min
Tetrahydrofuran - 3.8 min
Data Handling System: Hewlitt-Packard 9826 computer

B. METHOD

The bioassay and reference samples were analyzed on the gas chromatographic system given above. The ratio of the sample peak areas to the internal standard peak areas was obtained for the bioassay sample and then normalized to the average sample to internal standard ratio obtained for the reference sample.

C. RESULTS

The purity of the bioassay sample, relative to that of the reference sample, was found to be 100.7 ± 0.1(s)%.

III. CONCLUSIONS

The sample of the bioassay material was not found to be significantly different from the reference sample stored at -20°C at MRI.

This analysis was performed by the Bioanalytical Chemistry Section at Midwest Research Institute. Dr. Evelyn Murrill served as technical consultant for this analysis.

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Internal Analytical Report
MRI Project No. 7452-E
August 25, 1983

REANALYSIS OF ETHYLENE DICHLORIDE (LOT NO. 5027 EJ)

I. PURPOSE

To confirm the purity of the ethylene dichloride being used in the chronic inhalation study by comparison with a reference sample stored at -20°C.

II. ANALYSIS BY GAS CHROMATOGRAPHY

A. SYSTEM

Instrument: Varian 3700 gas chromatograph
Detector: Flame ionization
Column: 80/100 Carbopack C/0.1% SP-1000; 1.8 m x 4 mm ID; glass
Carrier Gas: Nitrogen
Carrier Gas Flow Rate: 70 cc/min
Detector Temperature: 250°C
Inlet Temperature: 200°C
Column Oven Temperature Program: 55°C, isothermal
Samples Injected: Solutions of 0.5% (v/v) ethylene dichloride in methylene chloride with ∿ 0.2% tetrahydrofuan as the internal standard
Retention Times: Ethylene dichloride - 6.0 min
Tetrahydrofuran - 3.8 min
Data Handling System: Hewlett-Packard 3380 A integrator

B. METHOD

The bioassay and reference samples were analyzed on the gas chromatographic system given above. The ratio of the sample peak areas to the internal standard peak areas was obtained for the bioassay sample and then normalized to the average sample to internal standard ratio obtained for the reference sample.

C. RESULTS

The purity of the bioassay sample, relative to that of the reference sample, was found to be 100.0 ± 0.1(s)%.

III. CONCLUSIONS

The sample of the bioassay material was not found to be significantly different from the reference sample stored at -20°C at MRI.

This analysis was performed by the Bioanalytical Chemistry Section at Midwest Research Institute. Dr. Evelyn Murrill served as technical consultant for this analysis.

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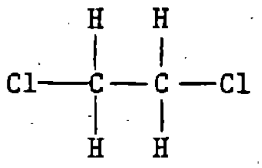
MIDWEST RESEARCH INSTITUTE
NIOSH CONTRACT NO. 200-82-2508
MRI Project No. 7452-E
Internal Analytical Report
October 7, 1983

COMPOUND: 1,2-Dichloroethane



$Cl-\underset{H}{\overset{H}{C}}-\underset{H}{\overset{H}{C}}-Cl$

$C_2H_4Cl_2$ M.W. 187.88 Lot No.: 1420 TJ

I. LIMITED BULK CHEMICAL CHARACTERIZATION

A. HOMOGENIZATION

The sample was received in a 1-L glass bottle and was mixed by manually shaking and inverting the bottle for ∿ 5 min.

B. REANALYSIS SAMPLE STORAGE

Five-milliliter aliquots were transferred by pipet to 6 x 5 mL amber septum vials which had been purged with nitrogen. A nitrogen headspace was placed over each sample, and the vials were sealed with Teflon®-lined septa and aluminum seals. The samples were stored at -20°C.

C. ANALYSIS

1. INFRARED SPECTROSCOPY

Instrument: Perkin-Elmer 283
Cell: Thin film between silver chloride plates
Results: See attached spectrum (Figure 1)

Spectrum consistent with structure and literature reference.[1]

---

[1] Sadtler Standard Spectra, Sadtler Research Laboratories, Philadelphia, Pennsylvania, IR No. 35.

2. GAS CHROMATOGRAPHY

Instrument: Varian 3700
Detector: Flame ionization
Inlet Temperature: 200°C
Detector Temperature: 250°C
Carrier Gas: Nitrogen
Carrier Flow Rate: 70 cc/min
Column: 80/100 Carbopack C/0.1% SP-1000, 1.8 m x 4 mm ID, glass
Oven Temperature Program: 50°C for 5 min, then 50 to 200°C at 10°/min
Samples Injected: Neat liquid (5 µL); 1.0% and 0.5% solutions of 1,2-dichloroethane in methylene chloride to quantitate the major peak and check for detector overloading.
Results: Major peak only, with no impurities observed having areas of 0.1% or greater relative to the major peak. Three impurities were observed eluting before the major peak with areas less than 0.1% (see Figure 2).

Peak No.	Retention Time (min)	Retention Time (Relative to Major Peak)	Area (% of Major Peak Area)
1	9.4	1.0	100

3. CONCLUSION

The sample was identified as 1,2-dichloroethane by infrared spectroscopy. Gas chromatographic analysis detected no impurities 0.1% or greater, relative to the major peak, indicating a purity > 99%. This lot of ethylene dichloride was found to be of comparable purity with lot Nos. 2403-TH and 5027-EJ.

This analysis was conducted by the Bioanalytical Chemistry Section at Midwest Research Institute. Dr. Evelyn Murrill served as technical consultant for this analysis.

MIDWEST RESEARCH INSTITUTE

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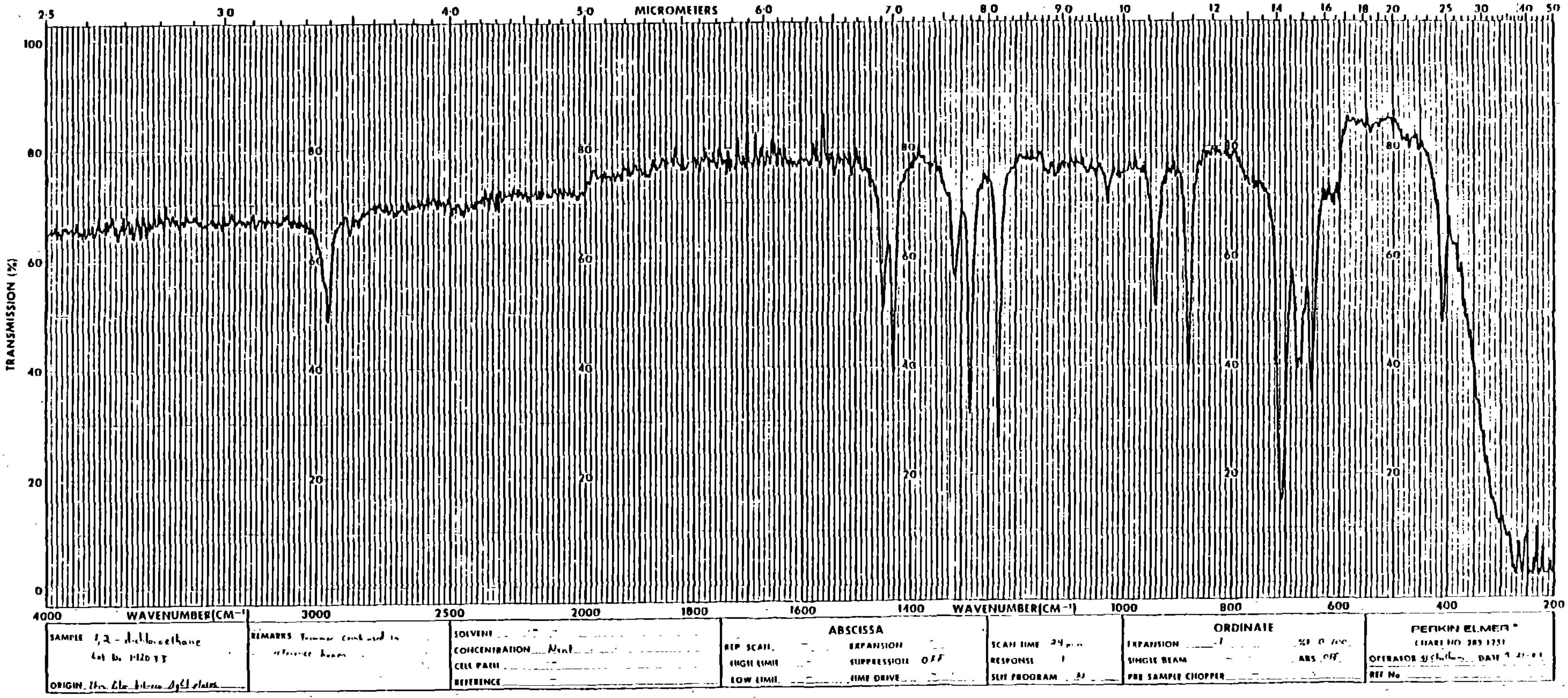


SAMPLE 1,2 - dichloroethane [illegible]

ORIGIN [illegible]

REMARKS [illegible]

SOLVENT –

CONCENTRATION Neat

CELL PATH –

REFERENCE –

REP. SCAN. –

HIGH LIMIT –

LOW LIMIT –

EXPANSION –

SUPPRESSION OFF

TIME DRIVE –

SCAN TIME [illegible]

RESPONSE 1

SLIT PROGRAM [illegible]

EXPANSION 1

%T 0 [illegible]

SINGLE BEAM –

ABS OFF

PRE SAMPLE CHOPPER –

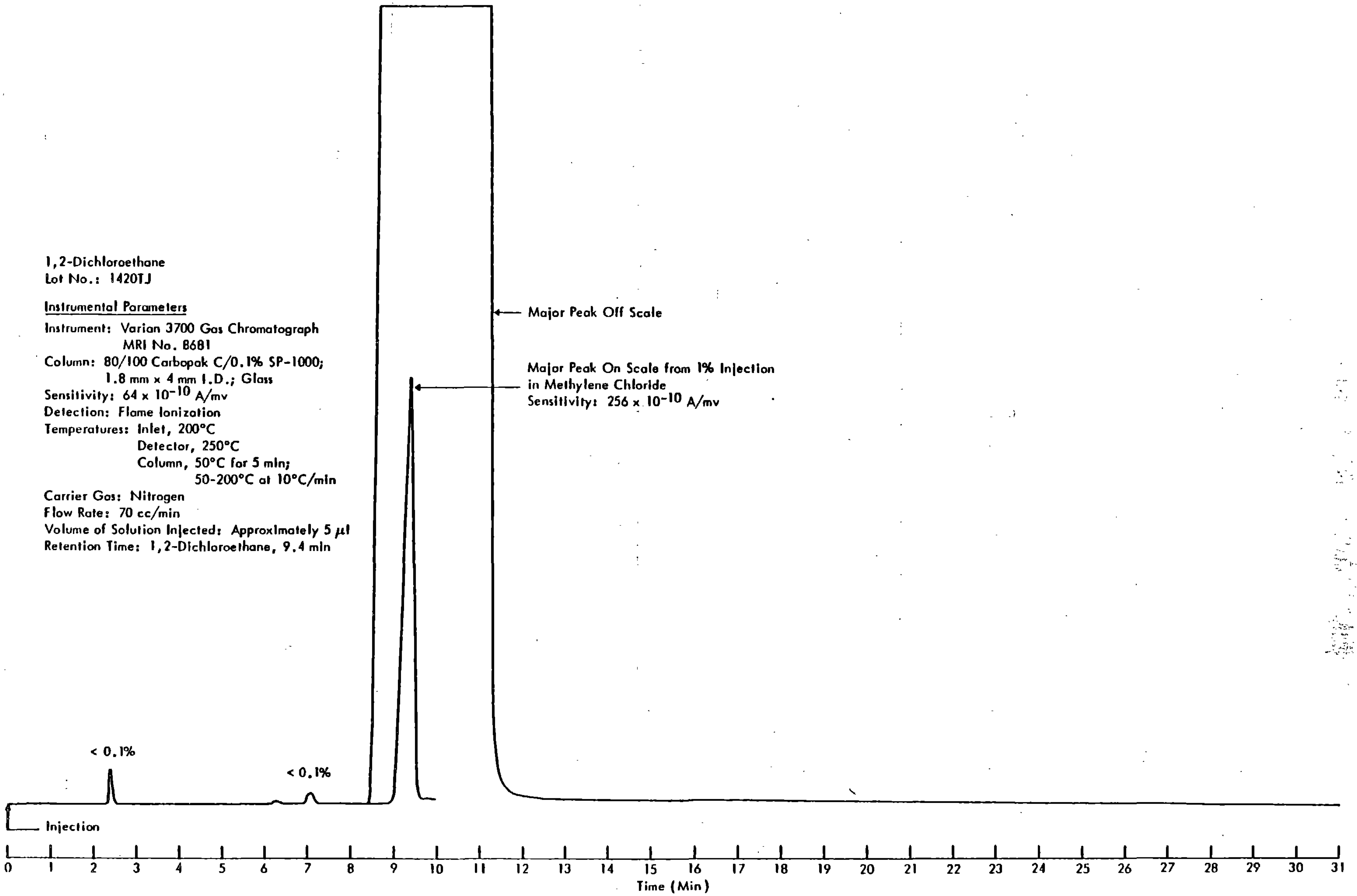
CHART NO. [illegible]

OPERATOR [illegible]

DATE [illegible]

REF No. –

Figure 1 - Infrared Spectrum of 1,2-Dichloroethane



1,2-Dichloroethane
Lot No.: 1420TJ

<u>Instrumental Parameters</u>

Instrument: Varian 3700 Gas Chromatograph
MRI No. 8681
Column: 80/100 Carbopak C/0.1% SP-1000;
1.8 mm x 4 mm I.D.; Glass
Sensitivity: 64 x 10^{-10} A/mv
Detection: Flame Ionization
Temperatures: Inlet, 200°C
Detector, 250°C
Column, 50°C for 5 min;
50-200°C at 10°C/min
Carrier Gas: Nitrogen
Flow Rate: 70 cc/min
Volume of Solution Injected: Approximately 5 µl
Retention Time: 1,2-Dichloroethane, 9.4 min

Figure 2 - Gas Chromatographic Profile of 1,2-Dichloroethane

Internal Analytical Report
MRI Project No. 7452-E
January 4, 1984

REANALYSIS OF ETHYLENE DICHLORIDE (LOT NO. 5027 EJ)

I. PURPOSE

To confirm the purity of the ethylene dichloride being used in the chronic inhalation study by comparison with a reference sample stored at -20°C.

II. ANALYSIS BY GAS CHROMATOGRAPHY

A. SYSTEM

Instrument: Varian 3700 gas chromatograph
Detector: Flame ionization
Column: 80/100 Carbopack C/0.1% SP-1000; 1.8 m x 4 mm ID; glass
Carrier Gas: Nitrogen
Carrier Gas Flow Rate: 70 cc/min
Detector Temperature: 250°C
Inlet Temperature: 200°C
Column Oven Temperature Program: 55°C, isothermal
Samples Injected: Solutions of 0.5% (v/v) ethylene dichloride in methylene chloride with ∼ 0.2% tetrahydrofuran as the internal standard
Retention Times: Ethylene dichloride - 5.9 min
Tetrahydrofuran - 3.6 min
Data Handling System: Hewlett-Packard 3380 A integrator

B. METHOD

The bioassay and reference samples were analyzed on the gas chromatographic system given above. The ratio of the sample peak areas to the internal standard peak areas was obtained for the bioassay sample and then normalized to the average sample to internal standard ratio obtained for the reference sample.

C. RESULTS

The purity of the bioassay sample, relative to that of the reference sample, was found to be 99.2 ± 0.5(s)%.

III. CONCLUSIONS

The sample of the bioassay material was not found to be significantly different from the reference sample stored at -20°C at MRI.

This analysis was performed by the Bioanalytical Chemistry Section at Midwest Research Institute. Dr. Evelyn Murrill served as technical consultant for this analysis.

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Internal Analytical Report
MRI Project No. 7452-A
May 4, 1984

REANALYSIS OF ETHYLENE DICHLORIDE (LOT NO. 1420 TJ)

I. PURPOSE

To confirm the purity of the ethylene dichloride being used in the chronic inhalation study by comparison with a reference sample stored at -20°C.

II. ANALYSIS BY GAS CHROMATOGRAPHY

A. SYSTEM

Instrument: Varian 3700 gas chromatograph
Detector: Flame ionization
Column: 80/100 Carbopack C/0.1% SP-1000; 1.8 m x 4 mm ID; glass
Carrier Gas: Nitrogen
Carrier Gas Flow Rate: 70 cc/min
Detector Temperature: 250°C
Inlet Temperature: 200°C
Column Oven Temperature Program: 55°C, isothermal
Samples Injected: Solutions of 0.5% (v/v) ethylene dichloride in methylene chloride with ∿ 0.2% tetrahydrofuran as the internal standard
Retention Times: Ethylene dichloride - 5.9 min
Tetrahydrofuran - 3.6 min
Data Handling System: Nelson Analytical Data System

B. METHOD

The bioassay and reference samples were analyzed on the gas chromatographic system given above. The ratio of the sample peak areas to the internal standard peak areas was obtained for the bioassay sample and then normalized to the average sample to internal standard ratio obtained for the reference sample.

C. RESULTS

The purity of the bioassay sample, relative to that of the reference sample, was found to be 100.0 ± 0.2(s)% (n = 3).

III. CONCLUSIONS

The sample of the bioassay material was not found to be significantly different from the reference sample stored at -20°C at MRI.

This analysis was performed by the Bioanalytical Chemistry Section at Midwest Research Institute. Dr. Evelyn Murrill served as technical consultant for this analysis.

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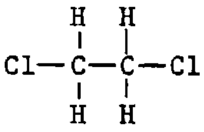
MIDWEST RESEARCH INSTITUTE
NIOSH CONTRACT NO. 200-82-2508
MRI Project No. 7452-A
Internal Analytical Report
August 14, 1984

COMPOUND: 1,2-Dichloroethane



$$\mathrm{Cl{-}\overset{\displaystyle H}{\underset{\displaystyle H}{C}}{-}\overset{\displaystyle H}{\underset{\displaystyle H}{C}}{-}Cl}$$

$C_2H_4Cl_2$

Lot No. 2401 HL

M.W. 187.88

I. LIMITED BULK CHEMICAL CHARACTERIZATION

A. HOMOGENIZATION

The sample was received in a 1-L glass bottle and was mixed by manually shaking and inverting the bottle for ∿ 5 min.

B. REANALYSIS SAMPLE STORAGE

Five-milliliter aliquots were transferred by pipet to 4 x 5-mL amber septum vials which had been purged with nitrogen. A nitrogen headspace was placed over each sample, and the vials were sealed with Teflon®-lined septa and aluminum seals. The samples were stored at -20°C.

C. ANALYSIS

1. INFRARED SPECTROSCOPY

Instrument: Perkin-Elmer 283
Cell: Thin film between silver chloride plates
Results: See attached spectrum (Figure 1)

Spectrum consistent with structure and literature reference.[1]

---

[1] Sadtler Standard Spectra, Sadtler Research Laboratories, Philadelphia, Pennsylvania, IR No. 35.

2. GAS CHROMATOGRAPHY

Instrument: Varian 3700
Detector: Flame ionization
Inlet Temperature: 200°C
Detector Temperature: 250°C
Carrier Gas: Nitrogen
Carrier Flow Rate: 70 cc/min
Column: 80/100 Carbopack C/0.1% SP-1000, 1.8 m x 4 mm ID, glass
Oven Temperature Program: 50°C for 5 min, then 50 to 200°C at 10°/min
Samples Injected: Neat liquid (4 μL); 1.0% and 0.5% solutions of 1,2-dichloroethane in methylene chloride to quantitate the major peak and check for detector overloading.

Results: A major peak and one impurity having an area 0.1% or greater relative to the major peak area were observed in the sample. This impurity was found to elute after the major peak. Three additional impurities were observed with areas less than 0.1%; two eluted before and one after the major peak. The total combined area of the impurity peaks was 0.32% of the major peak area (see Figure 2).

Peak No.	Retention Time (min)	Retention Time (Relative to Major Peak)	Area (% of Major Peak Area)
1	1.01	0.15	0.005
2	1.39	0.21	0.01
3	6.62	1.00	100
4	11.76	1.78	0.01
5	19.63	2.96	0.30

3. CONCLUSION

The sample was identified as 1,2-dichloroethane by infrared spectroscopy. Gas chromatographic analysis detected one impurity 0.1% or greater, relative to the major peak. Three smaller impurities having areas less than 0.1% relative to the major peak were also detected in the sample. The combined area of the impurity peaks totaled 0.32% of the major peak, indicating a purity > 99%.

This analysis was conducted by the Bioanalytical Chemistry Section at Midwest Research Institute. Dr. Evelyn Murrill served as technical consultant for this analysis.

MIDWEST RESEARCH INSTITUTE

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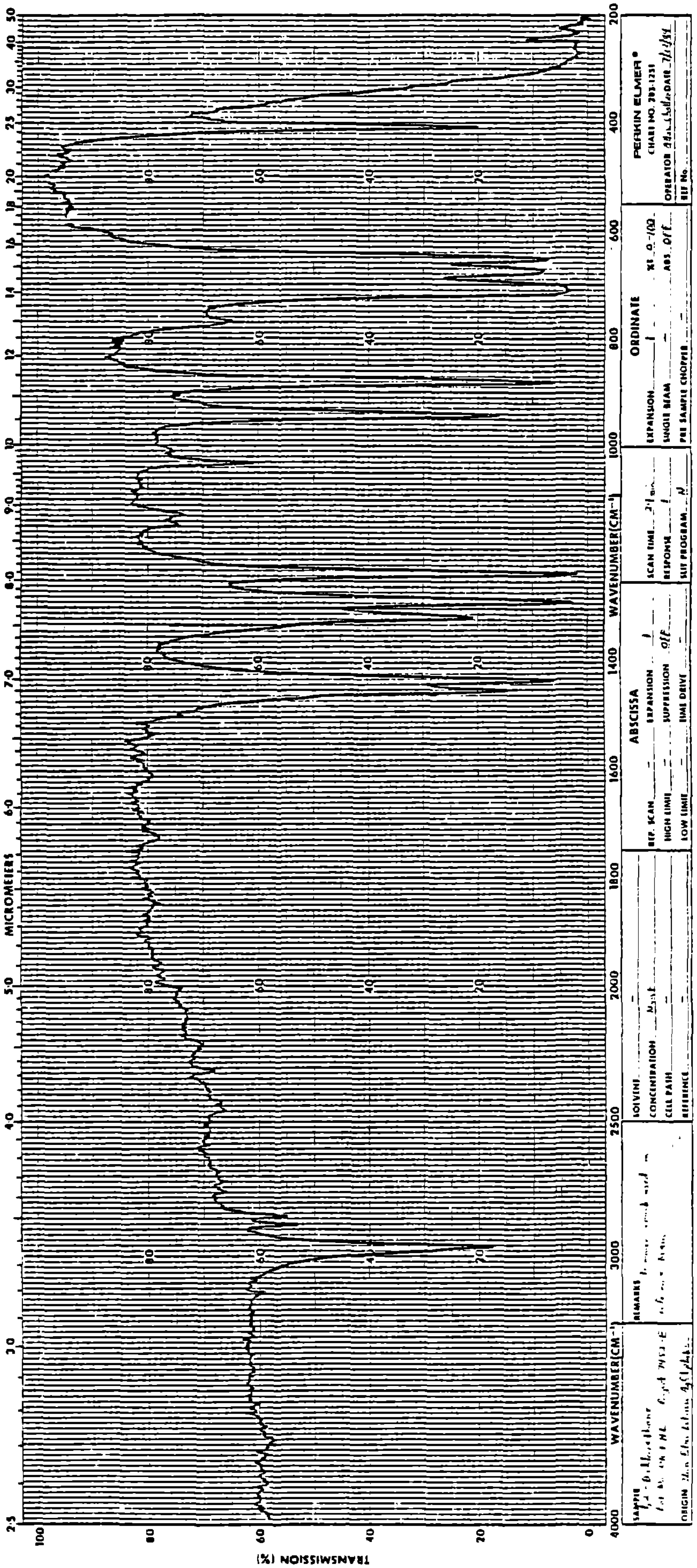
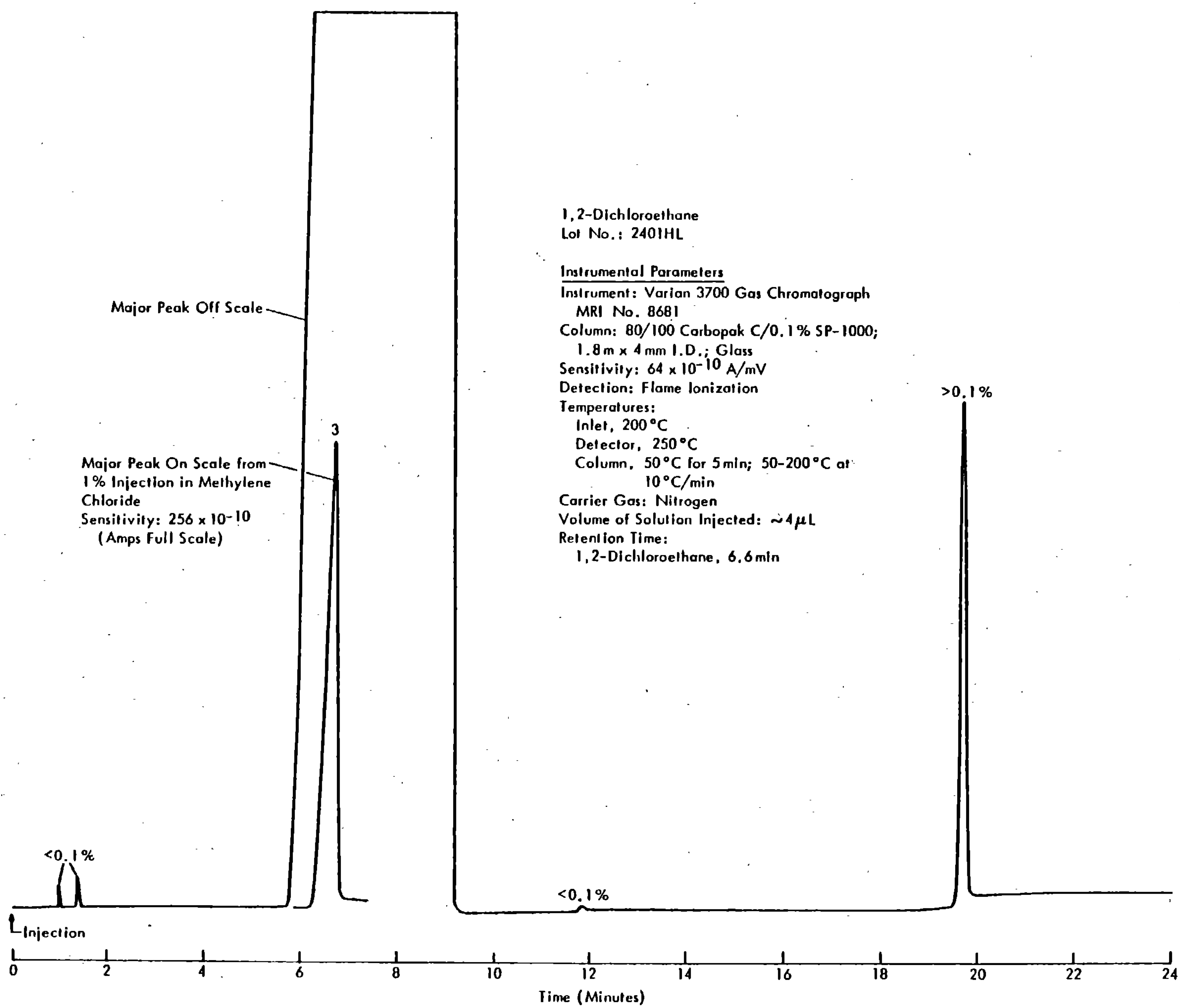


Figure 1 - Infrared Spectrum of 1,2-Dichloroethane



1,2-Dichloroethane
Lot No.: 2401HL

<u>Instrumental Parameters</u>
Instrument: Varian 3700 Gas Chromatograph
MRI No. 8681
Column: 80/100 Carbopak C/0.1% SP-1000;
1.8 m x 4 mm I.D.; Glass
Sensitivity: 64×10^{-10} A/mV
Detection: Flame Ionization
Temperatures:
Inlet, 200°C
Detector, 250°C
Column, 50°C for 5 min; 50-200°C at 10°C/min
Carrier Gas: Nitrogen
Volume of Solution Injected: ~4 μL
Retention Time:
1,2-Dichloroethane, 6.6 min

Figure 2 - Gas Chromatographic Profile of 1,2-Dichloroethane

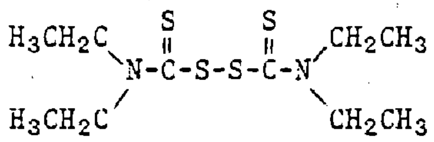
APPENDIX 2

BULK CHEMICAL ANALYSES REPORTS
(DISULFIRAM)

Lot No. S062982, 9/1/82
Lot No. S062982, 1/17/83
Lot No. S062982, 5/10/83
Lot No. S062982, 8/30/83
Lot No. 89C0022, 10/7/83
Lot No. S062982, 1/9/84
Lot No. 89C0022, 5/4/84
Lot No. 89C0022, 9/19/84

MIDWEST RESEARCH INSTITUTE
NIOSH CONTRACT NO. 200-82-2508
MRI Project No. 7452-B
September 1, 1982

COMPOUND: Disulfiram



$C_{10}H_{20}N_2S_4$
M.W. 296.54

Lot No.: S062982

I. LIMITED BULK CHEMICAL CHARACTERIZATION

A. CHEMICAL HANDLING

The compound was received in two plastic containers. The contents of the containers were combined in a Ball Mill and milled for ~ 30 min. The compound was then transferred to 3 x 1-qt amber glass containers and stored at 25°C.

B. REANALYSIS SAMPLE STORAGE

Approximately 3.5 g of sample was placed in each of eight 5-ml amber septum vials. The vials were sealed with Teflon®-lined septa and aluminum seals and stored at -20°C.

C. ANALYSIS

1. SPECTRAL DATA

a. Infrared

Determined	Literature Values
Instrument: Perkin-Elmer 283 Cell: 1% in potassium bromide pellet Results: See attached spectrum (Figure 1)	Spectrum consistent with structure and literature reference.[1]

---

[1] Sadtler Pharmaceutical Spectra, Sadtler Research Laboratories, Philadelphia, Pennsylvania, IR No. R239.

Determined | Literature Values

b. Ultraviolet/Visible

Instrument: Cary 219

No absorbance maximum was observed from 800 to 350 nm (visible region) but an increase in absorbance was observed as 350 nm was approached, at a concentration of 1% (w/v).

λ_{max} (nm)	$\varepsilon \times 10^{-4}$
283 (shoulder)	1.20 ± 0.03(s)
250 (shoulder)	1.33 ± 0.03(s)
215	2.11 ± 0.06(s)

Solvent: 95% ethanol

Spectrum consistent with structure. No literature reference found.

c. Nuclear Magnetic Resonance

Instrument: Varian EM-360A
Solvent: Deuterated chloroform with tetramethylsilane internal reference.

Spectrum consistent with structure and literature reference.[2]

Assignments: See attached spectrum (Figure 2)

(a) unresolved m, δ 1.36 ppm
(b) q, δ 4.01 ppm, J_{a-b} = 7 Hz
Solvent ($CHCl_3$) - s, δ 7.31 ppm

Integration Ratios:

	Determined	Theoretical
(a)	12.12	12
(b)	7.88	8

---

[2] Sheinin, Eric B., et al., J. Assoc. Off. Anal. Chem., 56(1), 126 (1973).

2. ELEMENTAL ANALYSIS

Element	C	H	N	S
Theoretical % (T)	40.50	6.80	9.45	43.25
Determined % (D)	40.69 40.58	6.91 6.95	9.35 9.48	42.87 42.62
Difference from theoretical ($\bar{D}$-T)	+0.14	+0.13	-0.04	-0.50
Relative agreement (% $\bar{D}$/T)	100.3	101.9	99.63	98.83

3. HIGH PERFORMANCE LIQUID CHROMATOGRAPHY

Instrumental System:
Pumps: Waters M6000A
Programmer: Waters 660
Detector: Waters 440
Injector: Rheodyne 7120
Detection: Ultraviolet, 254 nm
Column: Varian Micro Pak MCH-10, 300 x 4 mm ID
Solvent System:
A: Water
B: Methanol
Solvent Ratio: 43% A:57% B, isocratic
Flow Rate: 1.0 ml/min
Samples Injected: Solution containing 1.25 mg/ml disulfiram in methanol, filtered into a septum vial
Volume Injected: 20 µl
Results: Major peak and one impurity which eluted before the major peak. One additional impurity was observed before the major peak with an area less than 0.1% (see Figure 3).

Peak No.	Retention Time (min)	Retention Time (Relative to Major Peak)	Area (% of Major Peak)*
1	23.4	0.85	0.4
2	27.6	1.00	100

Developmental HPLC Observations: When a disulfiram solution of similar concentration to that above was injected at 100, 80, 75, and 65% B on the HPLC system described above, no additional impurities with areas greater than 0.1% were detected.

---

* Detector response is very dependent upon the absorbance of a substance at the detection wavelength used. The values reported are absolute areas expressed as percentages of the area of the major peak and do not take into account the different ε values of the compound and its impurities. Therefore, the areas reported do not necessarily reflect the actual weight percentages of the impurities in the sample.

4. DISCUSSION AND CONCLUSION

The sample was identified as disulfiram by spectroscopy. The elemental analyses for carbon, hydrogen, and nitrogen agreed with the theoretical values, but the analysis for sulfur was slightly low. High performance liquid chromatography indicated one impurity with an area of 0.4% relative to the major peak.

Cumulative data indicate that this sample of disulfiram has a purity of ∿ 99%.

II. ANALYSIS PROTOCOL FOR THE BIOASSAYER

A. GENERAL PROTOCOL

The objective is to determine whether a given compound as received and stored is, and remains, identical to that received and analyzed by MRI.

The most efficient method for determining stability is to maintain a stable standard for comparison with the stored bulk chemical. Therefore, when you receive the bulk shipment, remove standard samples of 3.5 g for each testing time.

Place each sample in a glass vial with a Teflon®-lined top, tightly closed and, if possible, sealed. Place samples in a freezer at -20°C for storage prior to analysis.

Remove a single vial of standard from the freezer approximately 4 hr prior to analysis. Obtain a sample of the stored bulk chemical. Analyze the two samples in tandem, so that test results for the bulk chemical and the standard can be directly compared. Also compare your test results to those given in the MRI analytical reports. Your analytical results may differ slightly from those reported by MRI. However, your standard and sample analyses should be identical to each other and identical to MRI data within expected variation limits.

Major peak comparison by HPLC, as described in Section II.B. of this report, is recommended for purity analysis of disulfiram.

B. PURITY ANALYSIS BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY

1. PROCEDURE

Prepare the internal standard solution and duplicate samples of the test material and the reference sample in the following manner:

a. Prepare a solution of propiophenone, the internal standard, by weighing 500 mg into a 250-ml volumetric flask and diluting to volume with ACS reagent grade methanol. Shake well to mix.

b. Accurately weigh approximately 47 mg of the sample into a 100-ml volumetric flask. Add 10 ml of the internal standard solution by volumetric pipet, and dilute to the mark with ACS reagent grade methanol. Shake well to mix.

c. Prepare a blank solution by pipetting 10 ml of the internal standard solution into a 100-ml volumetric flask and diluting to volume with methanol. Shake well to mix.

d. Make duplicate injections, at least, for each solution. Use an attenuation of 1.0 AUFS and an injection volume (~ 20 µl) to produce peaks having at least half-scale deflection. As nearly as practicable, use the instrument parameters described below, adjusting the solvent ratio, if necessary, to obtain retention volumes close to those reported by MRI.

Pumps: Waters M6000A
Programmer: Waters 660
Detector: Waters 440
Injector: Rheodyne 7120

Detection: Ultraviolet, 254 nm
Column: Varian Micro Pak MCH-10, 300 x 4 mm ID
Solvent System:
  A: Water
  B: Methanol
Solvent Ratio: 25% A:75% B
Flow Rate: 2.0 ml/min
Retention Volumes:
  Propiophenone (Internal Standard) - 4.0 ml
  Disulfiram - 5.4 ml

2. CALCULATIONS

Determine the peak heights of disulfiram and the internal standard peaks. Calculate a RRF (relative response factor) for each test and reference sample injection. Use the injections of the blank solution to determine that there are no interfering peaks under the test sample peak.

$$\text{RRF} = \frac{\text{Peak Height Compound}}{\text{Peak Height Internal Standard x Weight Sample (in mg)}}$$

Determine the relative purity of the test material by the formula:

$$\text{Relative \% Purity} = \frac{\overline{\text{RRF}}\text{ Test Compound}}{\overline{\text{RRF}}\text{ Reference Material}} \text{ x } 100$$

Also note and report any impurities detected in the test compound during the analysis.

III. CONTRIBUTORS

Personnel contributing to the analysis of disulfiram were Alice Clark and Terry Witherington.

Chemical Characterization

Richard D Brown for
Lee W. Pittman
Assistant Chemist

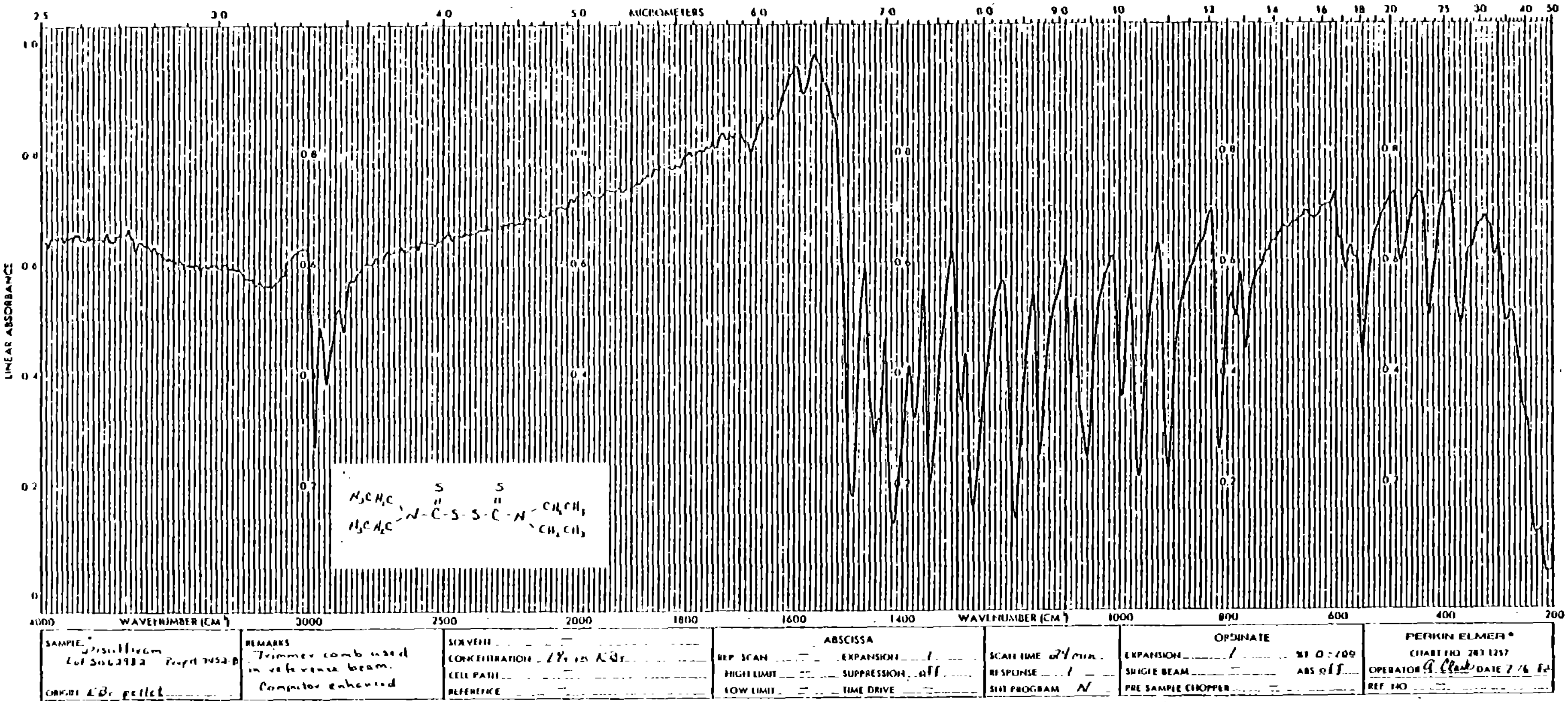
Linda Siemann
Linda Siemann
Assistant Chemist

Richard D Brown
Richard D. Brown
Associate Chemist

Approved:

Evelyn Murrill
Evelyn Murrill, Ph.D.
Senior Advisor for Chemistry
and Biology

E. J. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry Section



SAMPLE Disulfuram
Lot 506298A Req'd 7452-B
ORIGIN KBr pellet

REMARKS Trimmer comb used in reference beam. Computer enhanced

SOLVENT —
CONCENTRATION 1% in KBr
CELL PATH —
REFERENCE —

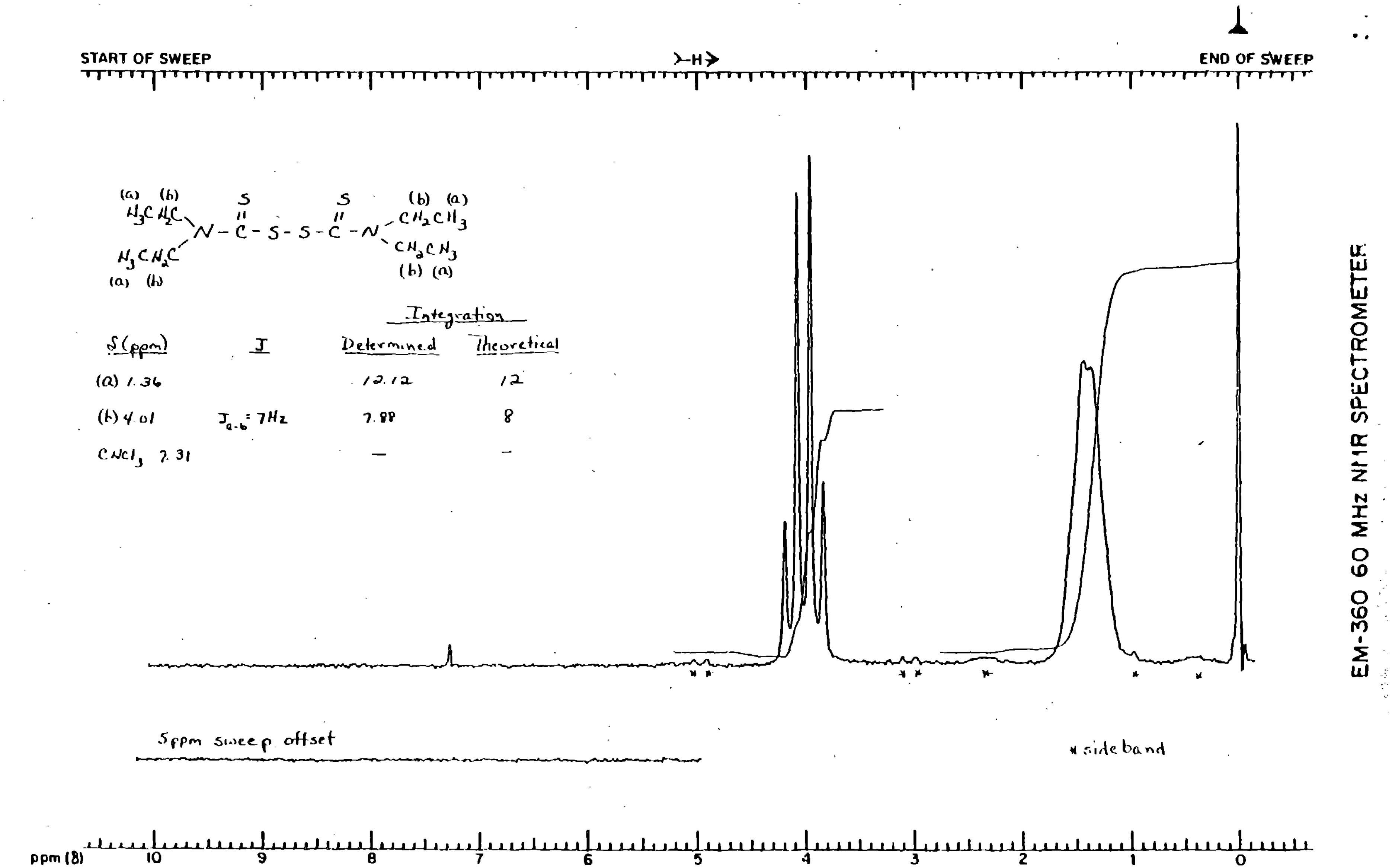
ABSCISSA
REP SCAN — EXPANSION 1
HIGH LIMIT — SUPPRESSION off
LOW LIMIT — TIME DRIVE —

SCAN TIME 24 min.
RESPONSE 1
SLIT PROGRAM N

ORDINATE
EXPANSION 1 %T 0-709
SINGLE BEAM — ABS off
PRE SAMPLE CHOPPER —

PERKIN ELMER®
CHART NO 283 1257
OPERATOR G. Clark DATE 7/6 Fe
REF NO —

Figure 1 - Infrared Spectrum of Disulfuram



(a) (b) H_3CH_2C, H_3CH_2C (a) (b) $N-\overset{S}{\overset{\|}{C}}-S-S-\overset{S}{\overset{\|}{C}}-N$ CH_2CH_3 (b) (a), CH_2CH_3 (b) (a)

		Integration	
δ(ppm)	J	Determined	Theoretical
(a) 1.36		12.12	12
(b) 4.01	$J_{a\text{-}b}$ = 7Hz	7.88	8
CHCl$_3$ 7.31		—	—

LOCK POS. — ppm
LOCK POWER — mG
DECOUPLE POS. — ppm
DECOUPLING POWER — mG
SPECTRUM AMPL. 3x100
FILTER 0.1 sec
RF POWER 0.02 mG
SWEEP TIME 5 min
SWEEP WIDTH 10 ppm
END OF SWEEP 0 ppm
NUCLEUS proton
ZERO REF. TMS
SAMPLE TEMP. amb. °C
SAMPLE: Disulfiram Lot 5062982 Project 7452 B
SOLVENT: CDCl$_3$
OPERATOR TTO
DATE 2-20-82
SPECTRUM NO. —

Figure 2 - Nuclear Magnetic Resonance Spectrum of Disulfuram

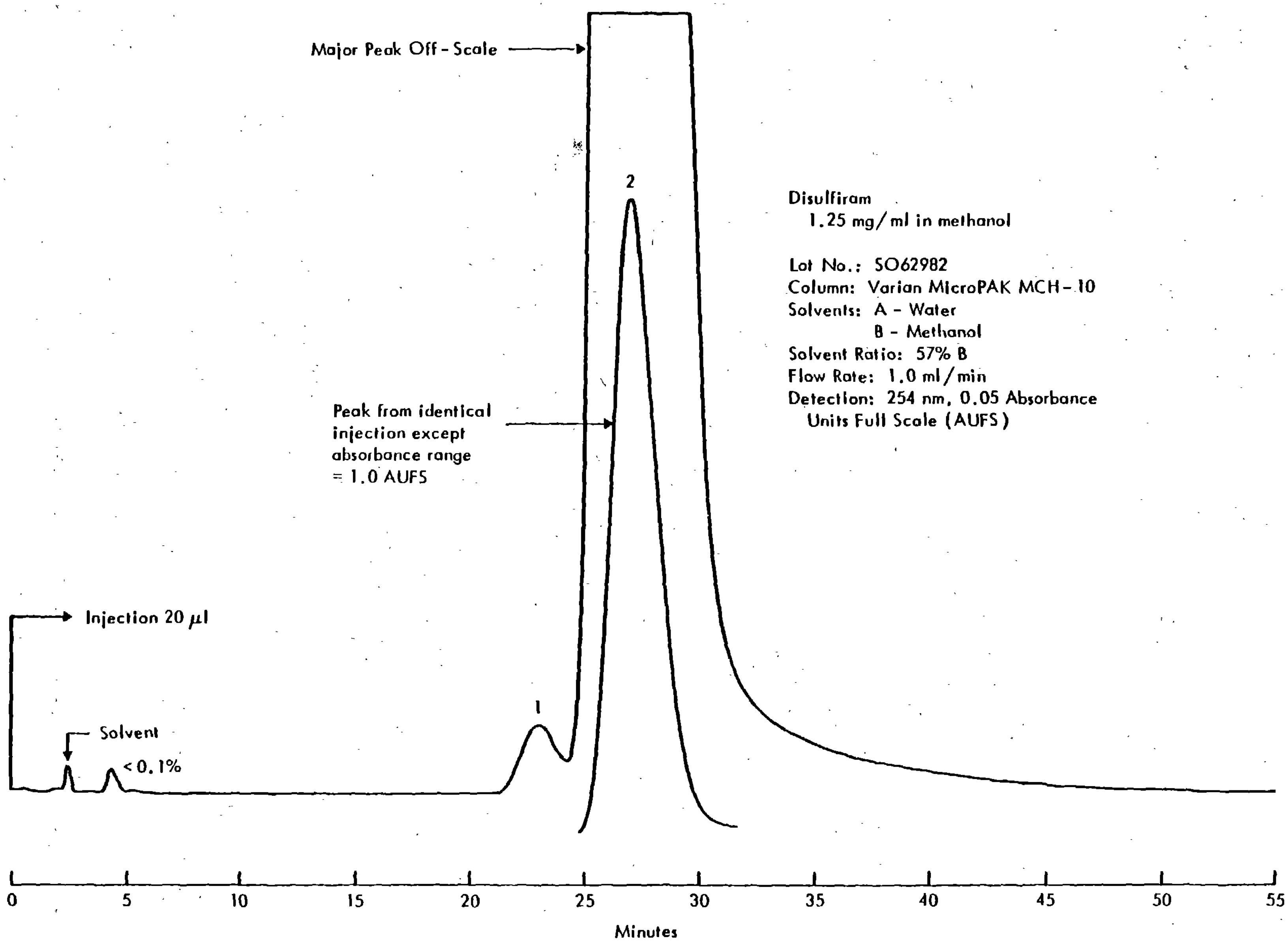


Figure 3 - High Performance Liquid Chromatographic Profile of Disulfiram

INTERNAL ANALYTICAL REPORT
January 17, 1983

REANALYSIS OF DISULFIRAM, LOT SO-62982 - PROJECT NO. 7452-B

I. PURPOSE

To confirm the purity of the disulfiram currently being used for the bioassay entitled "Study on the Carcinogenicity and Toxicity of Inhaled 1,2-Dichloroethane in Rats Treated with Disulfiram or Ethanol." This sample was taken at the ~ 4 months point in the study and was compared with disulfiram stored at -20°C as a reference standard.

II. ANALYSIS

Accurately weighed portions (~ 47 ± 0.01 mg) of disulfiram sample were weighed in triplicate and transferred to individual 100-ml volumetric flasks. A similar accurately weighed portion of disulfiram reference chemical was placed in a separate 100-ml volumetric flask.

The chemical in each flask was dissolved in ~ 50 ml of methanol. Internal standard solution (10 ml of propiophenone solution, 2 mg/ml in methanol) was then pipetted into the flasks, and the solutions were diluted to 100 ml with methanol. A 10-ml volume of the internal standard solution was diluted to 100 ml with methanol for use as a reagent blank. Aliquots (20 μl) of each solution were injected in duplicate into the high performance liquid chromatography system described below.

Pumps: Waters Model 6000
Detector: Waters Model 440, 254 nm, 1.0 AUFS
Injector: Rheodyne, 20 μl
Column: Varian Micro Pak MCH-10, 300 mm x 4 mm ID
Flow Rate: 2.0 ml/min
Mobile Phase: Water:methanol, 250:750 v/v
Retention Times: Disulfiram - 2.6 min
Propiophenone (Internal Standard) - 2.0 min

III. RESULTS

Relative response factors (compound peak height/internal standard peak height) were calculated for each injection and adjusted for individual sample weights. Relative percent purity was determined by comparing the mean RRF values for each sample determination with the mean RRF of the reference chemical and converting to percent. Results from the three determinations are shown below.

Relative % Purity of Disulfiram

100.5
100.8
100.6

$\bar{x} = 100.6 \pm 0.2(s)\%$

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute by Jake Hays.

MIDWEST RESEARCH INSTITUTE

Gustav Kuhn
Senior Chemist

Approved:

E. J. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry
Department

INTERNAL ANALYTICAL REPORT
May 10, 1983

REANALYSIS OF DISULFIRAM, LOT SO-62982 - MRI PROJECT NO. 7452-E

I. Purpose

To confirm the purity of the disulfiram being used in the chronic bioassay study by comparison with a reference sample stored at -20°C.

II. Analysis by High Performance Liquid Chromatography

A. System

Pumps: Waters Model 6000
Detector: Waters Model 440, 254 nm, 2.0 AUFS
Injector: Rheodyne, 20 µl
Column: Varian Micro Pak MCH-10, 300 mm x 4 mm ID
Flow Rate: 2.0 ml/min
Mobile Phase: Water:methanol, 250:750 v/v
Retention Times: Disulfiram - 3.2 min
Propiophenone (Internal Standard) - 2.0 min

B. Method

Accurately weighed aliquots (∿ 47 mg) of the bioassay and the reference samples were transferred to 100 ml volumetric flasks. Ten milliliters (accurately delivered) of internal standard solution (a 2 mg/ml solution of propiophenone in methanol) was added to each flask, and the flasks diluted to volume with methanol. A solvent blank was prepared by diluting 10 ml of internal standard solution to 100 ml with methanol. An aliquot of each solution was filtered through a 0.45 µ filter, sealed in a septum vial and analyzed for disulfiram concentration using the HPLC system described above. The ratio of the sample peak areas to the internal standard peak areas, after correction for sample weight, was obtained for the bioassay sample and then normalized to the corrected average sample to internal standard ratio obtained for the reference sample.

C. Results

The purity of the biossay sample, relative to that of the reference sample, was found to be 100.0 ± 0.4(s)% (N=3).

III. Conclusions

The sample of the bioassay material was not found to be significantly different from the reference sample stored at -20°C.

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute by Dennis Hooton. Dr. Evelyn Murrill served as technical consultant.

MIDWEST RESEARCH INSTITUTE

Gustav Kuhn
Senior Chemist

Approved:

E. J. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry
Section

INTERNAL ANALYTICAL REPORT
August 30, 1983

REANALYSIS OF DISULFIRAM, LOT SO-62982 - MRI PROJECT NO. 7452-E

I. Purpose

To confirm the purity of the disulfiram being used in the chronic inhalation study by comparison with a reference sample stored at -20°C.

II. Analysis by High Performance Liquid Chromatography

A. System

Pumps: Waters Model 6000
Detector: Waters Model 440, 254 nm, 2.0 AUFS
Injector: Rheodyne, 20 µl
Column: Varian Micro Pak MCH-10, 300 mm x 4 mm ID
Flow Rate: 2.0 ml/min
Mobile Phase: Water:methanol, 250:750 v/v
Retention Times: Disulfiram - 3.2 min
Propiophenone (Internal Standard) - 2.0 min

B. Method

Accurately weighed aliquots (∿ 47 mg) of the bioassay and the reference samples were transferred to 100 ml volumetric flasks. Ten milliliters (accurately delivered) of internal standard solution (a 2 mg/ml solution of propiophenone in methanol) was added to each flask, and the flasks diluted to volume with methanol. A solvent blank was prepared by diluting 10 ml of internal standard solution to 100 ml with methanol. An aliquot of each solution was filtered through a 0.45 µ filter, sealed in a septum vial and analyzed for disulfiram concentration using the HPLC system described above. The ratio of the sample peak areas to the internal standard peak areas, after correction for sample weight, was obtained for the bioassay sample and then normalized to the corrected average sample to internal standard ratio obtained for the reference sample.

C. Results

The purity of the bioassay sample, relative to that of the reference sample, was found to be 99.5 ± 0.7(s)% (N=3).

III. Conclusions

The sample of the bioassay material was not found to be significantly different from the reference sample stored at -20°C.

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute. Dr. Evelyn Murrill served as technical consultant.

MIDWEST RESEARCH INSTITUTE

allan Chatham

Allan Chatham
Junior Chemist

David H. Steele
Associate Chemist

Approved:

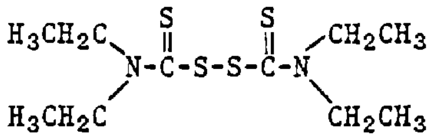
E. J. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry
Section

for

Evelyn Murrill, Ph.D.
Principal Advisor for Chemistry
and Biology

MIDWEST RESEARCH INSTITUTE
NIOSH CONTRACT NO. 200-82-2508
MRI Project No. 7452-E
October 7, 1983

COMPOUND: Disulfiram



$C_{10}H_{20}N_2S_4$
M.W. 296.54

Lot No.: 89C-0022
Batch No.: 02

I. LIMITED BULK CHEMICAL CHARACTERIZATION

A. CHEMICAL HANDLING

The compound was received in two plastic containers. The contents of the containers were combined in a Ball Mill and milled for ~ 30 min. The compound was then transferred to a 2-gal. metal can lined with plastic and stored at 25°C.

B. REANALYSIS SAMPLE STORAGE

Approximately 3.5 g of sample was placed in each of six 5-mL amber septum vials. The vials were sealed with Teflon®-lined septa and aluminum seals and stored at -20°C.

C. ANALYSIS

1. SPECTRAL DATA

	Determined	Literature Values
a. Infrared		
	Instrument: Perkin-Elmer 283 Cell: 1% in potassium bromide pellet Results: See attached spectrum (Figure 1)	Spectrum consistent with structure and literature reference.[1]

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[1] Sadtler Pharmaceutical Spectra, Sadtler Research Laboratories, Philadelphia, Pennsylvania, IR No. R239.

Determined | Literature Values

b. Ultraviolet/Visible

Instrument: Cary 219

No absorbance maximum was observed from 800 to 350 nm (visible region) but an increase in absorbance was observed as 350 nm was approached, at a concentration of 1% (w/v).

λ_{max} (nm)	ε x 10^{-4}
288	1.12 ± 0.01(s)
251 (shoulder)	1.27 ± 0.02(s)
217	1.99 ± 0.02(s)

Solvent: 95% ethanol

Literature Values: Spectrum consistent with structure. No literature reference found.

c. Nuclear Magnetic Resonance

Instrument: Varian EM-360A
Solvent: Deuterated chloroform with tetramethylsilane internal reference.

Literature Values: Spectrum consistent with structure and literature reference.[2]

Assignments: See attached spectrum (Figure 2)

(a) unresolved m, δ 1.40 ppm
(b) q, δ 4.01 ppm, J_{a-b} = 7 Hz
Solvent ($CHCl_3$) - s, δ 7.28 ppm

Integration Ratios:

	Determined	Theoretical
(a)	11.86	12
(b)	8.14	8

---

[2] Sheinin, Eric B., et al., J. Assoc. Off. Anal. Chem., 56(1), 126 (1973).

2. ELEMENTAL ANALYSIS

Element	C	H	N	S
Theoretical % (T)	40.50	6.80	9.45	43.25
Determined % (D)	40.53 40.45	6.69 6.66	9.37 9.41	42.11 42.13
Difference from theoretical ($\bar{D}$-T)	-0.01	-0.12	-0.06	-1.13
Relative agreement (% $\bar{D}$/T)	99.98	98.16	99.36	97.39

3. HIGH PERFORMANCE LIQUID CHROMATOGRAPHY

Instrumental System:
  Pumps: Varian 5020
  Detector: Waters 440
  Injector: Rheodyne 7120
Detection: Ultraviolet, 254 nm
Column: Varian Micro Pak MCH-10, 300 x 4 mm ID
Solvent System:
  A: Water
  B: Methanol
Solvent Ratio: 46% A:54% B, isocratic
Flow Rate: 1.0 mL/min
Samples Injected: Solution containing 1.23 mg/mL disulfiram in methanol, filtered into a septum vial
Volume Injected: 20 μL
Results: Major peak and two impurities which eluted before the major peak. Two additional impurities were observed before the major peak having areas less than 0.1% (see Figure 3).

Peak No.	Retention Time (min)	Retention Time (Relative to Major Peak)	Area (% of Major Peak)*
1	3.30	0.142	0.11
2	19.88	0.853	0.38
3	23.30	1.00	100

Developmental HPLC Observations: When a disulfiram solution of similar concentration to that above was injected at 100, 80, 75, and 65% B on the HPLC system described above, no additional impurities with areas greater than 0.1% were detected.

---

* Detector response is very dependent upon the absorbance of a substance at the detection wavelength used. The values reported are absolute areas expressed as percentages of the area of the major peak and do not take into account the different ε values of the compound and its impurities. Therefore, the areas reported do not necessarily reflect the actual weight percentages of the impurities in the sample.

4. DISCUSSION AND CONCLUSION

The sample was identified as disulfiram by spectroscopy. The elemental analyses for carbon and nitrogen agreed with the theoretical values, but the analysis for sulfur and hydrogen were slightly low. High performance liquid chromatography indicated two impurities having a combined area of 0.49% relative to the major peak.

Cumulative data indicate that this sample of disulfiram has a purity of ~ 99%. This lot of disulfiram was found to be of comparable purity with lot No. SO-62982.

II. ANALYSIS PROTOCOL FOR THE BIOASSAYER

A. GENERAL PROTOCOL

The objective is to determine whether a given compound as received and stored is, and remains, identical to that received and analyzed by MRI.

The most efficient method for determining stability is to maintain a stable standard for comparison with the stored bulk chemical. Therefore, when you receive the bulk shipment, remove standard samples of 3.5 g for each testing time.

Place each sample in a glass vial with a Teflon®-lined top, tightly closed and, if possible, sealed. Place samples in a freezer at -20°C for storage prior to analysis.

Remove a single vial of standard from the freezer approximately 4 hr prior to analysis. Obtain a sample of the stored bulk chemical. Analyze the two samples in tandem, so that test results for the bulk chemical and the standard can be directly compared. Also compare your test results to those given in the MRI analytical reports. Your analytical results may differ slightly from those reported by MRI. However, your standard and sample analyses should be identical to each other and identical to MRI data within expected variation limits.

Major peak comparison by HPLC, as described in Section II.B. of this report, is recommended for purity analysis of disulfiram.

B. PURITY ANALYSIS BY HIGH PERFORMANCE LIQUID CHROMATOGRAPHY

1. PROCEDURE

Prepare the internal standard solution and duplicate samples of the test material and the reference sample in the following manner:

a. Prepare a solution of propiophenone, the internal standard, by weighing 500 mg into a 250-mL volumetric flask and diluting to volume with ACS reagent grade methanol. Shake well to mix.

b. Accurately weigh approximately 47 mg of the sample into a 100-mL volumetric flask. Add 10 mL of the internal standard solution by volumetric pipet, and dilute to the mark with ACS reagent grade methanol. Shake well to mix.

c. Prepare a blank solution by pipetting 10 mL of the internal standard solution into a 100-mL volumetric flask and diluting to volume with methanol. Shake well to mix.

d. Make duplicate injections, at least, for each solution. Use an attenuation of 1.0 AUFS and an injection volume (~ 20 µL) to produce peaks having at least half-scale deflection. As nearly as practicable, use the instrument parameters described below, adjusting the solvent ratio, if necessary, to obtain retention volumes close to those reported by MRI.

Pumps: Waters M6000A
Programmer: Waters 660
Detector: Waters 440
Injector: Rheodyne 7120

Detection: Ultraviolet, 254 nm
Column: Varian Micro Pak MCH-10, 300 x 4 mm ID
Solvent System:
  A: Water
  B: Methanol
Solvent Ratio: 25% A:75% B
Flow Rate: 2.0 mL/min
Retention Volumes:
  Propiophenone (Internal Standard) - 4.0 mL
  Disulfiram - 5.4 mL

2. CALCULATIONS

Determine the peak heights of disulfiram and the internal standard peaks. Calculate a RRF (relative response factor) for each test and reference sample injection. Use the injections of the blank solution to determine that there are no interfering peaks under the test sample peak.

$$\text{RRF} = \frac{\text{Peak Height Compound}}{\text{Peak Height Internal Standard x Weight Sample (in mg)}}$$

Determine the relative purity of the test material by the formula:

$$\text{Relative \% Purity} = \frac{\overline{\text{RRF}}\text{ Test Compound}}{\overline{\text{RRF}}\text{ Reference Material}} \text{ x } 100$$

Also note and report any impurities detected in the test compound during the analysis.

III. CONTRIBUTORS

This analysis was conducted by the Bioanalytical Chemistry Section of Midwest Research Institute. Dr. Evelyn Murrill served as technical consultant for this analysis.

MIDWEST RESEARCH INSTITUTE

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Approved:

Evelyn Murrill

Evelyn Murrill, Ph.D.
Principal Advisor for Chemistry
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E. J. Woodhouse, Ph.D.
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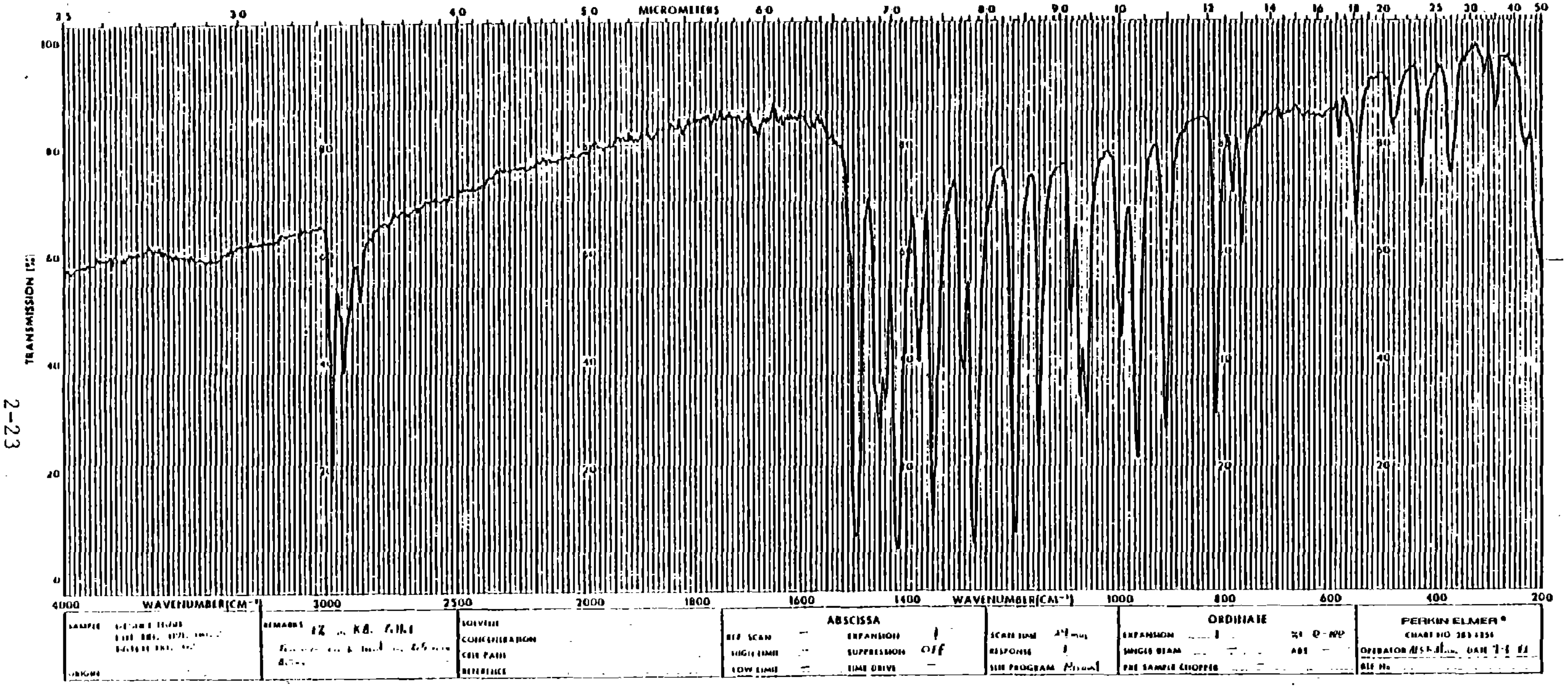
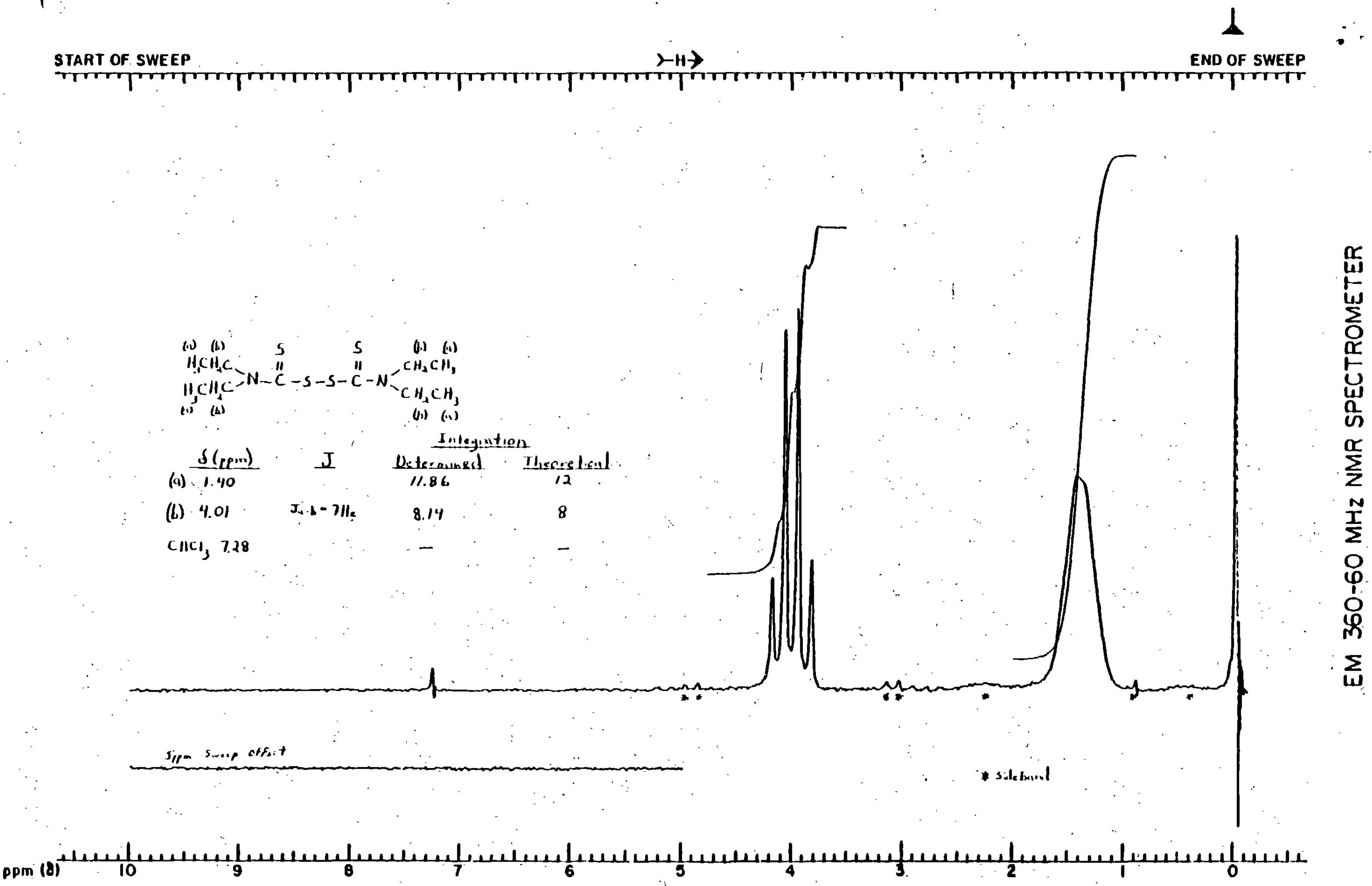


Figure 1 - Infrared Spectrum of Disulfiram



		Integration	
δ (ppm)	J	Determined	Theoretical
(a) 1.40		11.86	12
(b) 4.01	J_{a-b} = 7Hz	8.14	8
$CHCl_3$ 7.28		—	—

LOCK POS. – ppm

LOCK POWER – mG

DECOUPLE POS. – ppm

DECOUPLING POWER – mG

SPECTRUM AMPL. 3 x 100

FILTER 0.1 sec

RF POWER 0.05 mG

SWEEP TIME 5 min

SWEEP WIDTH 10 ppm

END OF SWEEP 0 ppm

NUCLEUS proton

ZERO REF. TMS

SAMPLE TEMP. Amb °C

SAMPLE

DISULFIRAN
LOT NO. B9C-0022
BATCH NO. 02

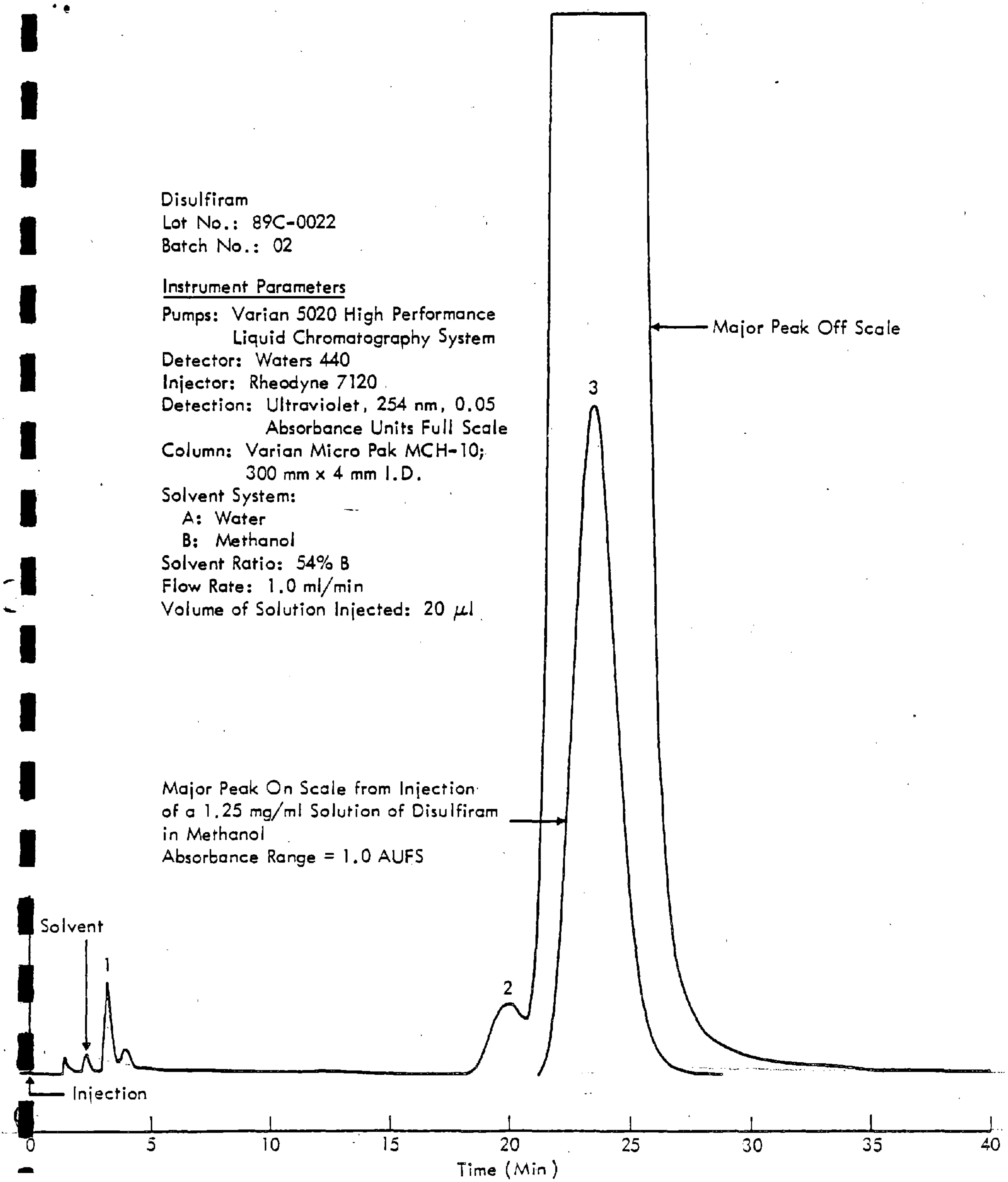
SOLVENT $CDCl_3$

OPERATOR Al Chatham

DATE 9-6-83

SPECTRUM NO.

Figure 2 - Nuclear Magnetic Resonance Spectrum of Disulfiram


Disulfiram
Lot No.: 89C-0022
Batch No.: 02

Instrument Parameters
Pumps: Varian 5020 High Performance Liquid Chromatography System
Detector: Waters 440
Injector: Rheodyne 7120
Detection: Ultraviolet, 254 nm, 0.05 Absorbance Units Full Scale
Column: Varian Micro Pak MCH-10; 300 mm x 4 mm I.D.
Solvent System:
A: Water
B: Methanol
Solvent Ratio: 54% B
Flow Rate: 1.0 ml/min
Volume of Solution Injected: 20 μl

Major Peak Off Scale

Major Peak On Scale from Injection of a 1.25 mg/ml Solution of Disulfiram in Methanol
Absorbance Range = 1.0 AUFS

Figure 3 - High Performance Liquid Chromatographic Profile of Disulfiram

INTERNAL ANALYTICAL REPORT
January 9, 1984

REANALYSIS OF DISULFIRAM, LOT SO-62982 - MRI PROJECT NO. 7452-E

I. Purpose

To confirm the purity of the disulfiram being used in the chronic inhalation study by comparison with a reference sample stored at -20°C.

II. Analysis by High Performance Liquid Chromatography

A. System

Pumps: Waters Model 6000
Detector: Waters Model 440, 254 nm, 2.0 AUFS
Injector: Rheodyne, 20 µL
Column: Varian Micro Pak MCH-10, 300 mm x 4 mm ID
Flow Rate: 2.0 mL/min
Mobile Phase: Water:methanol, 250:750 v/v
Retention Times: Disulfiram - 3.0 min
Propiophenone (Internal Standard) - 2.2 min

B. Method

Accurately weighed aliquots (~ 47 mg) of the bioassay and the reference samples were transferred to 100-mL volumetric flasks. Ten milliliters (accurately delivered) of internal standard solution (a 2 mg/mL solution of propiophenone in methanol) was added to each flask, and the flasks diluted to volume with methanol. A solvent blank was prepared by diluting 10 mL of internal standard solution to 100 mL with methanol. An aliquot of each solution was filtered through a 0.45 µ filter, sealed in a septum vial and analyzed for disulfiram concentration using the HPLC system described above. The ratio of the sample peak areas to the internal standard peak areas, after correction for sample weight, was obtained for the bioassay sample and then normalized to the corrected average sample to internal standard ratio obtained for the reference sample.

C. Results

The purity of the bioassay sample, relative to that of the reference sample, was found to be 100.2 ± 0.3(s)% (n = 3).

III. Conclusions

The sample of the bioassay material was not found to be significantly different from the reference sample stored at -20°C.

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute. Dr. Evelyn Murrill served as technical consultant.

MIDWEST RESEARCH INSTITUTE

allan Chatham

Allan Chatham
Junior Chemist

David H. Steele
Associate Chemist

Approved:

E. J. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry Section

Evelyn Murrill

Evelyn Murrill, Ph.D.
Principal Advisor for Chemistry
and Biology

Internal Analytical Report
MRI Project No. 7452-A
May 4, 1984

REANALYSIS OF DISULFIRAM, LOT NO. 89C-0022

I. PURPOSE

To confirm the purity of the disulfiram being used in the chronic inhalation study by comparison with a reference sample stored at -20°C.

II. ANALYSIS

A. System

Pumps: Waters Model 6000
Detector: Waters Model 440, 254 nm, 1.0 AUFS
Injector: Waters Intelligent Sample Processor, 25 µL
Column: Varian Micro Pak MCH-10, 300 mm x 4 mm ID
Flow Rate: 2.0 mL/min
Mobile Phase: Water:methanol, 250:750 v/v
Retention Times: Disulfiram - 3.0 min
Propiophenone (Internal Standard) - 1.8 min

B. Method

Accurately weighed aliquots (∿ 47 mg) of the bioassay and the reference samples were transferred to 100 mL volumetric flasks. Ten milliliters (accurately delivered) of internal standard solution (a 2 mg/mL solution of propiophenone in methanol) was added to each flask, and the flasks diluted to volume with methanol. A solvent blank was prepared by diluting 10 mL of internal standard solution to 100 mL with methanol. An aliquot of each solution was filtered through a 0.45 µ filter, sealed in a septum vial and analyzed for disulfiram concentration using the HPLC system described above. The ratio of the sample peak areas to the internal standard peak areas, after correction for sample weight, was obtained for the bioassay sample and then normalized to the corrected average sample to internal standard ratio obtained for the reference sample.

C. Results

The purity of the bioassay sample, relative to that of the reference sample, was found to be 100.8 ± 0.9(s)% (n = 3).

III. Conclusions

The sample of the bioassay material was not found to be significantly different from the reference sample stored at -20°C.

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute. Dr. Evelyn Murrill served as technical consultant for this analysis.

MIDWEST RESEARCH INSTITUTE

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Approved:

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Evelyn Murrill

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Internal Analytical Report
MRI Project No. 7452-A
September 19, 1984

REANALYSIS OF DISULFIRAM, LOT NO. 89C-0022

I. PURPOSE

To confirm the purity of the disulfiram being used in the chronic inhalation study by comparison with a reference sample stored at -20°C.

II. ANALYSIS

A. System

Pump: Waters Model 6000
Detector: Waters Model 440, 254 nm, 1.0 AUFS
Injector: Waters Intelligent Sample Processor, 15 μL
Column: Varian Micro Pak MCH-10, 300 mm x 4 mm ID
Flow Rate: 2.0 mL/min
Mobile Phase: Water:methanol, 250:750 v/v
Retention Times: Disulfiram - 2.9 min
Propiophenone (Internal Standard) - 2.1 min
Data System: Nelson 4400 Data System

B. Method

Accurately weighed aliquots (~ 47 mg) of the bioassay and the reference samples were transferred to 100-mL volumetric flasks. Ten milliliters (accurately delivered) of internal standard solution (a 2 mg/mL solution of propiophenone in methanol) was added to each flask, and the flasks diluted to volume with methanol. A solvent blank was prepared by diluting 10 mL of internal standard solution to 100 mL with methanol. An aliquot of each solution was filtered through a 0.45 μ filter, sealed in a septum vial and analyzed for disulfiram concentration using the HPLC system described above. The ratio of the sample peak areas to the internal standard peak areas, after correction for sample weight, was obtained for the bioassay sample and then normalized to the corrected average sample to internal standard ratio obtained for the reference sample.

C. Results

The purity of the bioassay sample, relative to that of the reference sample, was found to be 100.0 ± 0.1(s)%.

III. CONCLUSIONS

The sample of the bioassay material was not found to be significantly different from the reference sample stored at -20°C.

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute. Dr. Evelyn Murrill served as technical consultant for this analysis.

MIDWEST RESEARCH INSTITUTE

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APPENDIX 3

DISULFIRAM FEED STABILITY AND HOMOGENEITY REPORTS

STUDY ON THE CARCINOGENICITY AND TOXICITY OF INHALED 1,2-DICHLOROETHANE IN RATS TREATED WITH DISULFIRAM OR ETHANOL

CHEMICAL/VEHICLE STUDIES OF DISULFIRAM

INTERNAL REPORT

MIDWEST RESEARCH INSTITUTE
MRI Project No. 7452-B

October 4, 1982

For

National Institute for Occupational Safety and Health

I. INTRODUCTION

The chemical/vehicle studies described in this report were performed for the National Institute for Occupational Safety and Health in support of a study of the carcinogenicity and toxicity of inhaled 1,2-dichloroethane in rats treated with disulfiram or ethanol. All experimental work was conducted using a portion of the same lot of disulfiram submitted for bioassay.

The report presents descriptions of experimental procedures used for mixing disulfiram into feed, and gives results from homogeneity and stability studies performed on a laboratory-size feed blend prepared at a dose concentration of 0.05%.

II. MIXING STUDY

A. DOSED FEED PREPARATION

1. PARAMETERS

Batch size: 1,500 g
Concentration: 0.05% (500 μg/g)
Vehicle: Ralston-Purina Certified Rat Chow No. 5002
Blender: Patterson-Kelley Twin-Shell®, 4-qt, stainless steel, with intensifier bar

2. PREMIX PREPARATION

Disulfiram (750.6 mg), which had passed a 70-mesh sieve, was mixed by spatula with ∿ 1 g of feed. Additional portions of feed were blended into the mixture, doubling the weight of the batch with each addition. Then a final amount of feed was incorporated into the premix, making the total weight 200 g.

3. BULK MIXING

A 600-g portion of feed was layered evenly in the blender; then the 200-g premix was added in roughly equal amounts to both sides of the blender. The fine material adhering to the premix beaker was removed by stirring 100 g of feed in the beaker and pouring it onto the premix. After an additional 600 g of feed was added in roughly equal amounts to both shells, the blender ports were sealed. The mixture was blended for 15 min with the intensifier bar in operation for only the first 5 min. While mixing, the blender was periodically rapped to dislodged any feed packed into the corners.

B. HOMOGENEITY EVALUATION

1. SAMPLING AND ANALYSIS

A portion of dosed feed (50 g) was removed from each of the three blender ports. Triplicate 10.00-g samples from each portion were shaken for 30 min with 100 ml of UV-grade acetonitrile to extract the chemical. Three individually spiked portions of feed, dosed at the same concentration as the samples, were extracted with the samples to determine recovery of disulfiram from feed.

The extracts were clarified by centrifugation, then 10-ml aliquots were mixed with 3 ml of internal standard solution [butyrophenone, 0.75 mg/ml in methanol:water (75:25)] and diluted to 25 ml with methanol: water (75:25). A few milliliters of each solution were filtered through a 0.45 μ filter prior to being injected in duplicate into the high performance liquid chromatography system described below.

Pump: Waters M6000A
Injector: Rheodyne 7125
Detector: Waters 440 Wavelength: 280 nm
Attenuation: 0.05 AU full scale
Column: Waters Z-Module radial compression column with μBondapak C_{18} cartridge (115 mm x 8 mm I.D.)
Guard Column: Whatman CO:PELL ODS (72 mm x 2.3 mm I.D.)
Mobile Phase: Methanol:water (75:25)
Flow Rate: 3.0 ml/min
Injection Volume: 20 μl
Retention Times: Disulfiram - 3.3 min
Butyrophenone (Internal Standard) - 2.6 min

Detector response was monitored by injecting a matrix standard (disulfiram, 20 μg/ml in blank feed extract) after every third sample. A second, independently prepared matrix standard was used to verify the accuracy of the calibration standard. The chromatographic system was evaluated for linearity of response with matrix standard solutions of disulfiram at concentrations ranging from ~ 10 to 25 μg/ml. The correlation coefficient was 0.99997.

The concentration (micrograms per gram) of disulfiram in the dosed feed samples was calculated using the internal standard method, with appropriate correction for recovery.

2. RESULTS - HOMOGENEITY EVALUATION

Sampling Location	Disulfiram Found (µg/g)[a]	Found/Theoretical[b] (%)
Right shell	506	101.2
	507	101.4
	505	101.0
		$\bar{x}$ = 101.2 ± 0.2(s)
Left shell	496	99.2
	507	101.4
	507	101.4
		$\bar{x}$ = 100.7 ± 1.3(s)
Bottom port	506	101.2
	494	98.8
	503	100.6
		$\bar{x}$ = 100.2 ± 1.2(s)
Mean of all assays		$\bar{x}$ = 100.7 ± 1.0(s)

---

[a] Corrected for 98.0 ± 1.0(s)% recovery of chemical from spiked feed (n = 12).

[b] Theoretical concentration of disulfiram in the feed was 500 µg/g.

C. CONCLUSION

The mixing procedure developed for incorporating disulfiram into feed at the 0.05% level produced a uniform blend suitable for the bioassay studies. Chemical analysis of samples taken at three locations in the blender exhibited 1.0% maximum variation in dose concentration between any two sampling points.

III. STABILITY STUDY

A. TEST PARAMETERS

Concentration: 0.05% (500 µg/g)
Vehicle: Ralston-Purina Certified Rat Chow No. 5002
Storage Conditions:
  -20°C: 2, 4, and 5 weeks in the dark in sealed bottles
  5°C: 2, 4, and 5 weeks in the dark in sealed bottles
  Room Temperature: 7 and 14 days open to air and light in a rat cage

B. SAMPLE PREPARATION AND STORAGE

Six screw-cap jars, one for each of the storage conditions described above, were filled with ∿ 150 g of the 0.05% dosed feed blend prepared as described in the Dosed Feed Preparation section (p. 1). In addition, six 9-oz jars were half-filled with dosed feed (∿ 75 g) and placed, uncapped, on the bedding in a rat cage equipped with a filter cap. Three jars were removed for analysis after 7 days, and the other three jars were analyzed after 14 days. Samples for analysis from these jars were taken by scooping up feed near the surface, without disturbing the remainder of the feed in the bottles.

C. ANALYSIS PROCEDURE

The stability samples were analyzed using the procedure described in the Sampling and Analysis section (p. 2). The dosed feed stored in the rat cage was sampled by removing the top layer of feed from each jar.

D. RESULTS - STABILITY IN FEED

Storage Conditions	Disulfiram Found (μg/g)[a]	$\frac{\text{Found}}{\text{Theoretical}}$[b] (%)
1 week (rat cage)	414	82.8
	410	82.0
	417	83.4
		$\bar{x}$ = 82.7 ± 0.7(s)
2 weeks (-20°C)	496	99.2
	496	99.2
	488	97.6
		$\bar{x}$ = 98.7 ± 0.9(s)
2 weeks (5°C)	483	96.6
	480	96.0
	470	94.0
		$\bar{x}$ = 95.5 ± 1.4(s)
2 weeks (rat cage)	355	71.0
	340	68.0
	364	72.8
		$\bar{x}$ = 70.6 ± 2.4(s)
4 weeks (-20°C)	493	98.6
	492	98.4
	470	94.0
		$\bar{x}$ = 97.0 ± 2.6(s)
4 weeks (5°C)	471	94.2
	475	95.0
	451	90.2
		$\bar{x}$ = 93.1 ± 2.6(s)

Storage Conditions	Disulfiram Found (µg/g)[a]	$\frac{\text{Found}}{\text{Theoretical}}$[b] (%)
5 weeks (-20°C)	474	94.8
	474	94.8
	478	95.6
		$\bar{x}$ = 95.1 ± 0.5(s)
5 weeks (5°C)	468	93.6
	466	93.2
	464	92.8
		$\bar{x}$ = 93.2 ± 0.4(s)

Pooled standard deviation: 1.5%

---

[a] Corrected for 98.0 ± 1.0(s)% recovery of chemical from spiked feed (n = 12).

[b] Theoretical concentration of disulfiram in the feed was 500 µg/g.

E. CONCLUSION

Disulfiram mixed with rodent feed at 0.05% was unstable. Dosed feed stored open to air and light at room temperature exhibited ∿ 17% loss of chemical after 7 days and ∿ 29% loss after 14 days. Losses of 5%, 7%, and 7% of chemical were observed from samples stored at 5°C for 2, 4, and 5 weeks, respectively. The dosed feed was stable for 2 weeks at -20°C, but had lost ∿ 5% after 5 weeks. Based on the pooled standard deviation for the measured values, a 2.2% loss of chemical was required to conclude, at the 95% confidence level, that a sample was unstable.

IV. CONTRIBUTORS

The analytical work for the disulfiram study was performed by Katherine Edman and Sue Ann Scheppers.

Approved:

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MIDWEST RESEARCH INSTITUTE

J Rollheiser

John Rollheiser
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G Kuhn

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Senior Chemist

cc: E. Woodhouse
J. Kollheiser

September 30, 1982

Jim Cholakis

Gus Kuhn

Analysis of Disulfuram - Feed Sample (9/21/82 mix) Project No. 7452-B.

Analyses on the above sample are completed and results are shown below:

Label Conc. (µg/g)	Disulfuram Found (µg/g)	Found/Label (%)
500	514.6	102.9
500	513.4	103.7
500	503.3	100.3
	$\bar{x}$	102.5 ±1.5(s)

Theoretical content in this batch was [illegible]

GK:bjm

cc: E. Woodhouse
K. Stelting
J. Rollheiser

INTEROFFICE COMMUNICATION

MIDWEST RESEARCH INSTITUTE

October 13, 1982

To: Jim Cholakis

From: Gus Kuhn

Subject: Analysis for Disulfiram in Feed Samples, MRI Project No. 7452-B

Results of analyses for disulfiram in the dosed feed samples you submitted recently are shown below.

Mixing Date	Label Conc. (μg/g)	Disulfiram Found* (μg/g)	$\frac{\text{Found}}{\text{Label}}$ (%)
9/29/82 - #1	500	495	99.0
		497	99.4
			$\bar{x}$ 99.2 ± 0.3(s)
9/29/82 - #2	500	493	98.7
		492	98.4
			$\bar{x}$ 98.6 ± 0.2(s)
10/6/82 - #1	500	510	102.0
		505	101.0
			$\bar{x}$ 101.5 ± 0.7(s)
10/6/82 - #2	500	504	100.8
		505	101.0
			$\bar{x}$ 100.9 ± 0.1(s)
10/6/82 - #3	500	488	97.6
		497	99.4
			$\bar{x}$ 98.5 ± 1.3(s)
10/6/82 - #4	500	510	102.0
		507	101.4
			$\bar{x}$ 101.7 ± 0.5(s)

---

* Results corrected for 98.8% recovery from feed.

GK/kf

cc: E. Woodhouse
K. Stelting
J. Rollheiser

INTEROFFICE COMMUNICATION

MIDWEST RESEARCH INSTITUTE

November 4, 1982

To: Jim Cholakis

From: Gus Kuhn

Subject: Analysis for Disulfiram in Feed Samples, MRI Project No. 7452-B

Results of analyses for disulfiram in the dosed feed samples you submitted recently are shown below.

Mixing Date	Label Conc. (μg/g)	Disulfiram Found* (μg/g)	$\frac{\text{Found}}{\text{Label}}$ (%)
10/27/82 - #1	500	511	102.2
		521	104.2
			$\bar{x}$ 103.2 ± 1.4(s)
10/27/82 - #2	500	510	102.0
		517	103.4
			$\bar{x}$ 102.7 ± 1.0(s)
10/27/82 - #3	500	511	102.0
		517	103.4
			$\bar{x}$ 102.7 ± 1.0(s)
10/27/82 - #4	500	516	103.2
		527	105.4
			$\bar{x}$ 104.3 ± 1.6(s)

---

* Results corrected for 98.0% recovery from feed.

INTEROFFICE COMMUNICATION

MIDWEST RESEARCH INSTITUTE

cc: E. Woodhouse
K. Stelting
J. Rollheiser

November 24, 1982

To: Jim Cholakis

From: Gus Kuhn

Subject: Analysis for Disulfiram in Feed Samples, MRI Project No. 7452-B

Results of analyses for disulfiram in the dosed feed samples you submitted recently are shown below.

Mixing Date	Label Conc. (µg/g)	Disulfiram Found* (µg/g)	$\frac{\text{Found}}{\text{Label}}$ (%)
11/18/82 - #1	500	516	103.2
		518	103.6
			$\bar{x}$ 103.4 ± 0.3(s)
11/18/82 - #2	500	508	101.6
		524	104.8
			$\bar{x}$ 103.2 ± 2.3(s)
11/18/82 - #3	500	540	108.0
		527	105.4
			$\bar{x}$ 106.7 ± 1.8(s)
11/18/82 - #4	500	517	103.4
		538	107.6
			$\bar{x}$ 105.5 ± 3.1(s)

---

* Results corrected for 96.3 ± 0.5(s)% recovery from feed (n = 3).

GK/gls

cc: E. Woodhouse
K. Stelting
J. Rollheiser
D. Steele

INTEROFFICE COMMUNICATION

MIDWEST RESEARCH INSTITUTE

December 28, 1982

To: Jim Cholakis

From: Gus Kuhn

Subject: Analysis for Disulfiram in Feed Samples, MRI Project No. 7452-B

Results of analyses for disulfiram in the dosed feed samples you submitted recently are shown below.

Mixing Date	Label Conc. (µg/g)	Disulfiram Found (µg/g)	Found / Label (%)
12/16/82 - #1	500	499	99.8
		512	102.4
			$\bar{x}$ 101.1 ± 1.8(s)
12/16/82 - #2	500	492	98.4
		504	100.8
			$\bar{x}$ 99.6 ± 1.7(s)
12/16/82 - #3	500	493	98.6
		496	99.2
			$\bar{x}$ 98.9 ± 0.4(s)
12/16/82 - #4	500	505	101.0
		503	100.6
			$\bar{x}$ 100.8 ± 0.3(s)

GK/kf

GKuhn

INTERNAL ANALYTICAL REPORT
January 17, 1983
Revised February 11, 1983*

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-B

I. PURPOSE

To determine the concentration of disulfiram in four dosed feed samples submitted by the MRI Toxicology Department.

II. SAMPLE IDENTIFICATION

Mixing Date	Sample No.	Amount Received
1/5/83	1	~ 50 g
1/5/83	2	~ 50 g
1/5/83	3	~ 50 g
1/5/83	4	~ 50 g

III. ANALYSIS

These samples were analyzed by a high performance liquid chromatographic analysis method described previously in MRI Internal Report "Chemical/Vehicle Studies of Disulfiram" dated October 4, 1982. Each sample was analyzed in duplicate.

IV. RESULTS

Sample No.	Disulfiram in Feed Label Conc (%)	 % Found	$\frac{\text{Found}}{\text{Label}}$ (%)
1	0.05	0.0488	97.6
		0.0481	96.2
			$\bar{x}$ = 96.9 ± 1.0(s)
2	0.05	0.0488	97.6
		0.0487	97.4
			$\bar{x}$ = 97.5 ± 0.1(s)
3	0.05	0.0476	95.2
		0.0476	95.2
			$\bar{x}$ = 95.2 ± 0(s)
4	0.05	0.0479	95.8
		0.0470	94.0
			$\bar{x}$ = 94.9 ± 1.3(s)

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* This revision corrects the reference to a gas chromatographic method in the Analysis section. Feed samples containing disulfiram were analyzed by a high performance liquid chromatographic method.

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute by Kathy Edman.

MIDWEST RESEARCH INSTITUTE

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Gustav Kuhn
Senior Chemist

Approved:

E. J. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry
Section

INTERNAL ANALYTICAL REPORT
February 10, 1983

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-B

I. PURPOSE

To determine the concentration of disulfiram in four dosed feed samples submitted by the MRI Toxicology Department.

II. SAMPLE IDENTIFICATION

Mixing Date	Sample No.	Amount Received
2/2/83	1	~ 50 g
2/2/83	2	~ 50 g
2/2/83	3	~ 50 g
2/2/83	4	~ 50 g

III. ANALYSIS

These samples were analyzed by a high performance liquid chromatographic method described previously in MRI Internal Report "Chemical/Vehicle Studies of Disulfiram" dated October 4, 1982. Each sample was analyzed in duplicate.

IV. RESULTS

Sample No.	Disulfiram in Feed		$\frac{\text{Found}}{\text{Label}}$ (%)
	Label Conc (%)	% Found	
1	0.05	0.0483	96.6
		0.0496	99.2
			$\bar{x}$ = 97.9 ± 1.8(s)
2	0.05	0.0476	95.2
		0.0478	95.6
			$\bar{x}$ = 95.4 ± 0.3(s)
3	0.05	0.0490	98.0
		0.0486	97.2
			$\bar{x}$ = 97.6 ± 0.6(s)
4	0.05	0.0487	97.4
		0.0490	98.0
			$\bar{x}$ = 97.7 ± 0.4(s)

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute by Kathy Edman.

MIDWEST RESEARCH INSTITUTE

Gustav Kuhn
Senior Chemist

Approved:

E. J. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry Section

INTERNAL ANALYTICAL REPORT
March 7, 1983

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-B

I. PURPOSE

To determine the concentration of disulfiram in four dosed feed samples submitted by the MRI Toxicology Department.

II. SAMPLE IDENTIFICATION

Mixing Date	Sample No.	Amount Received
2/25/83	1	∿ 50 g
2/25/83	2	∿ 50 g
2/25/83	3	∿ 50 g
2/25/83	4	∿ 50 g

III. ANALYSIS

These samples were analyzed by a high performance liquid chromatographic method described previously in MRI Internal Report "Chemical/Vehicle Studies of Disulfiram" dated October 4, 1982. Each sample was analyzed in duplicate.

IV. RESULTS

Sample No.	Disulfiram in Feed Label Conc (%)	Disulfiram in Feed % Found	$\frac{\text{Found}}{\text{Label}}$ (%)
1	0.05	0.0509	101.8
		0.0520	104.0
			$\bar{x}$ = 102.9 ± 1.6(s)
2	0.05	0.0484	96.8
		0.0494	98.8
			$\bar{x}$ = 97.8 ± 1.4(s)
3	0.05	0.0491	98.2
		0.0488	97.6
			$\bar{x}$ = 97.9 ± 0.4(s)
4	0.05	0.0493	98.6
		0.0494	98.8
			$\bar{x}$ = 98.7 ± 0.1(s)

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute by Kathy Edman.

MIDWEST RESEARCH INSTITUTE

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Senior Chemist

Approved:

E. L. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry
Section

INTERNAL ANALYTICAL REPORT
April 11, 1983

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT No. 7452-B

I. PURPOSE

To determine the concentration of disulfiram in four dosed feed samples submitted by the MRI Life Sciences Department.

II. SAMPLE IDENTIFICATION

Mixing Date	Sample No.	Amount Received
3/22/83	1	∿ 50 g
3/22/83	2	∿ 50 g
3/22/83	3	∿ 50 g
3/22/83	4	∿ 50 g

III. ANALYSIS

These samples were analyzed by a high performance liquid chromatographic method described previously in MRI Internal Report, "Chemical/Vehicle Studies of Disulfiram," dated October 4, 1982. Each sample was analyzed in duplicate.

IV. RESULTS

Sample	Disulfiram in Feed		Found/Label (%)
No.	Label Conc. (%)	% Found	
1	0.05	0.0498	99.6
		0.0496	99.2
			$\bar{x}$ = 99.4 ± 0.3(s)
2	0.05	0.0464	92.8
		0.0466	93.2
			$\bar{x}$ = 93.0 ± 0.3(s)
3	0.05	0.0471	94.2
		0.0468	93.6
			$\bar{x}$ = 93.9 ± 0.4(s)
4	0.05	0.0472	94.4
		0.0471	94.2
			$\bar{x}$ = 94.3 ± 0.1(s)

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute by Kathy Edman.

MIDWEST RESEARCH INSTITUTE

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Approved:

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Head, Bioanalytical Chemistry
Section

INTERNAL ANALYTICAL REPORT

April 25, 1983

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-B

I. PURPOSE

To determine the concentration of disulfiram in four dosed feed samples submitted by the MRI Life Sciences Department.

II. SAMPLE IDENTIFICATION

Mixing Date	Sample No.	Amount Received
4/18/83	1	∿ 50 g
4/18/83	2	∿ 50 g
4/18/83	3	∿ 50 g
4/18/83	4	∿ 50 g

III. ANALYSIS

These samples were analyzed by a high performance liquid chromatographic method described previously in MRI Internal Report, "Chemical/Vehicle Studies of Disulfiram," dated October 4, 1982. Each sample was analyzed in duplicate.

IV. RESULTS

Sample No.	Disulfiram in Feed			Found Label (%)
	Label Conc. (%)	% Found		
1	0.05	0.0476		95.2
		0.0484		96.8
			$\bar{x}$ =	96.0 ± 1.1(s)
2	0.05	0.0475		95.0
		0.0469		93.8
			$\bar{x}$ =	94.4 ± 0.8(s)
3	0.05	0.0480		96.0
		0.0476		95.2
			$\bar{x}$ =	95.6 ± 0.6(s)
4	0.05	0.0494		98.8
		0.0506		101.2
			$\bar{x}$ =	100.0 ± 1.7(s)

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute by Kathy Edman.

MIDWEST RESEARCH INSTITUTE

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Approved:

E. J. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry
Section

INTERNAL ANALYTICAL REPORT
May 13, 1983

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-E

I. PURPOSE

To determine the concentration of disulfiram in four dosed feed samples submitted by the MRI Pharmacology and Toxicology Section of the Life Sciences Department.

II. SAMPLE IDENTIFICATION

Mixing Date	Sample No.	Amount Received
5/5/83	1	∿ 50 g
5/5/83	2	∿ 50 g
5/5/83	3	∿ 50 g
5/5/83	4	∿ 50 g

III. ANALYSIS

These samples were analyzed by a high performance liquid chromatographic method described previously in MRI Internal Report "Chemical/Vehicle Studies of Disulfiram" dated October 4, 1982. Each sample was analyzed in duplicate.

IV. RESULTS

Sample No.	Disulfiram in Feed		$\frac{\text{Found}}{\text{Label}}$ (%)
	Label Conc (%)	% Found	
1	0.05	0.0486	97.2
		0.0484	96.8
			$\bar{x}$ = 97.0 ± 0.3(s)
2	0.05	0.0481	96.2
		0.0472	94.4
			$\bar{x}$ = 95.3 ± 1.3(s)
3	0.05	0.0475	95.0
		0.0474	94.8
			$\bar{x}$ = 94.9 ± 0.1(s)
4	0.05	0.0484	96.8
		0.0492	98.4
			$\bar{x}$ = 97.6 ± 1.1(s)

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute by Cheri Cox.

MIDWEST RESEARCH INSTITUTE

Gustav Kuhn
Senior Chemist

Approved:

E. J. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry Section

INTERNAL ANALYTICAL REPORT

June 6, 1983

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-E

I. PURPOSE

To determine the concentration of disulfiram in one dosed feed sample submitted by the MRI Pharmacology and Toxicology Section of the Life Sciences Department.

II. SAMPLE IDENTIFICATION

Mixing Date	Lot No.	Amount Received
6/2/83	1	∿ 50 g

III. ANALYSIS

This sample was analyzed in triplicate by a high performance liquid chromatographic method described previously in MRI Internal Report "Chemical/Vehicle Studies of Disulfiram" dated October 4, 1982.

IV. RESULTS

Sample No.	Disulfiram in Feed		Found/Label (%)
	Label Conc (%)	% Found	
1	0.05	0.0482	96.4
		0.0480	96.0
		0.0473	94.6
			$\bar{x}$ = 95.7 ± 0.9(s)

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute by Cheri Cox.

MIDWEST RESEARCH INSTITUTE

Gustav Kuhn
Senior Chemist

Approved:

E. J. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry Section

INTERNAL ANALYTICAL REPORT

July 12, 1983

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-E

I. PURPOSE

To determine the concentration of disulfiram in four dosed feed samples submitted by the MRI Pharmacology and Toxicology Section of the Life Sciences Department.

II. SAMPLE IDENTIFICATION

Mixing Date	Lot No.	Amount Received
6/29/83	1	∿ 50 g
6/29/83	2	∿ 50 g
6/29/83	3	∿ 50 g
6/29/83	4	∿ 50 g

III. ANALYSIS

These samples were analyzed in duplicate by a high performance liquid chromatographic method described previously in MRI Internal Report "Chemical/Vehicle Studies of Disulfiram" dated October 4, 1982.

IV. RESULTS

Lot No.	Disulfiram in Feed		Found/Label (%)
	Label Conc. (%)	% Found	
1	0.05	0.0495	99.0
		0.0492	98.4
			$\bar{x}$ = 98.7 ± 0.4(s)
2	0.05	0.0488	97.6
		0.0482	96.4
			$\bar{x}$ = 97.0 ± 0.8(s)
3	0.05	0.0494	98.8
		0.0494	98.8
			$\bar{x}$ = 98.8 ± 0.0(s)
4	0.05	0.0484	96.8
		0.0494	98.8
			$\bar{x}$ = 97.8 ± 1.4(s)

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute by Cheri Cox.

MIDWEST RESEARCH INSTITUTE

David H. Steele
Associate Chemist

Approved:

E. J. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry Section

INTERNAL ANALYTICAL REPORT

July 13, 1983

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-E

I. PURPOSE

To determine the concentration of disulfiram in four lots of dosed feed prepared by the MRI Pharmacology and Toxicology Section of the Life Sciences Department.

II. INTRODUCTION

Four lots of dosed feed, prepared by the Deramus Field Station staff on June 9, 1983, were analyzed for disulfiram concentration on June 13, 1983. The results indicated that all four lots were out of specification (∿ 86% of target). Consequently, additional disulfiram was added and the lots were remixed. Concentration analyses, performed on June 15, and 17, 1983, indicated acceptable disulfiram levels in all four remixed lots. The results from the analyses of both the original and remixed lots are presented in Section IV.

III. ANALYSIS

Duplicate samples from each lot were extracted and then analyzed by high performance liquid chromatography using the methods described previously (see MRI Internal Report "Chemical/Vehicle Studies of Disulfiram," dated October 4, 1982).

IV. RESULTS

		Original			Remixed		
Lot No.	Target Conc. (%)	Mixing Date	% Found	% of Target	Remixing Date	Found	% of Target
1	0.05	6/9/83	0.0436 0.0430	86.6 ± 0.8(s)	6/14/83	0.0520 0.0536	105.6 ± 2.3(s)
2	0.05	6/9/83	0.0432 0.0429	86.1 ± 0.4(s)	6/15/83	0.0474 0.0488	96.2 ± 2.0(s)
3	0.05	6/9/83	0.0432 0.0434	86.6 ± 0.3(s)	6/15/83	0.0518 0.0513	103.1 ± 0.7(s)
4	0.05	6/9/83	0.0446 0.0432	87.8 ± 2.0(s)	6/15/83	0.0518 0.0522	104.0 ± 0.6(s)

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute by Cheri Cox.

MIDWEST RESEARCH INSTITUTE

David H. Steele
Associate Chemist

Approved:

E. J. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry Section

INTERNAL ANALYTICAL REPORT

August 1, 1983

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES -- MRI PROJECT NO. 7452-E

I. PURPOSE

To determine the concentration of disulfiram in four dosed feed samples submitted by the MRI Pharmacology and Toxicology Section of the Life Sciences Department.

II. SAMPLE IDENTIFICATION

Mixing Date	Lot No.	Amount Received
7/27/83	5	∿ 50 g
7/27/83	6	∿ 50 g
7/27/83	7	∿ 50 g
7/27/83	8	∿ 50 g

III. ANALYSIS

These samples were analyzed in duplicate by a high performance liquid chromatographic method described previously in MRI Internal Report "Chemical/Vehicle Studies of Disulfiram" dated October 4, 1982.

IV. RESULTS

Lot No.	Disulfiram in Feed		$\frac{\text{Found}}{\text{Label}}$ (%)
	Label Conc. (%)	% Found	
5	0.05	0.0485	97.0
		0.0491	98.2
			$\bar{x}$ = 97.6 ± 0.8(s)
6	0.05	0.0487	97.4
		0.0482	96.4
			$\bar{x}$ = 96.9 ± 0.7(s)
7	0.05	0.0482	96.4
		0.0487	97.4
			$\bar{x}$ = 96.9 ± 0.7(s)
8	0.05	0.0489	97.8
		0.0486	97.2
			$\bar{x}$ = 97.5 ± 0.4(s)

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute by Cheri Cox.

MIDWEST RESEARCH INSTITUTE

Gustav Kuhn
Senior Chemist

Approved:

E. J. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry Section

INTERNAL ANALYTICAL REPORT

August 26, 1983

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-E

I. PURPOSE

To determine the concentration of disulfiram in four dosed feed samples submitted by the MRI Pharmacology and Toxicology Section of the Life Sciences Department.

II. SAMPLE IDENTIFICATION

Mixing Date	Lot No.	Amount Received
8/17/83	9	~ 50 g
8/17/83	10	~ 50 g
8/17/83	11	~ 50 g
8/17/83	12	~ 50 g

III. ANALYSIS

These samples were analyzed in duplicate by a high performance liquid chromatographic method described previously by MRI Internal Report "Chemical/Vehicle Studies of Disulfiram" dated October 4, 1982.

IV. RESULTS

Lot No.	Disulfiram in Feed		$\frac{\text{Found}}{\text{Label}}$ (%)
	Label Conc. (%)	% Found	
9	0.05	0.0496	
		0.0486	
		$\bar{x}$ = 0.0491 ± 0.0007(s)	$\bar{x}$ = 98.2 ± 1.4(s)
10	0.05	0.0500	
		0.0488	
		$\bar{x}$ = 0.0494 ± 0.0008(s)	$\bar{x}$ = 98.8 ± 1.7(s)
11	0.05	0.0497	
		0.0490	
		$\bar{x}$ = 0.0494 ± 0.0005(s)	$\bar{x}$ = 98.8 ± 1.0(s)
12	0.05	0.0496	
		0.0490	
		$\bar{x}$ = 0.0493 ± 0.0004(s)	$\bar{x}$ = 98.6 ± 0.8(s)

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute by Randy Peters and Cheri Cox.

MIDWEST RESEARCH INSTITUTE

Gustav Kuhn
Senior Chemist

Approved:

E. L. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry Section

MIDWEST RESEARCH INSTITUTE
INTERNAL ANALYTICAL REPORT

September 19, 1983

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-E

I. PURPOSE

To determine the concentration of disulfiram in four dosed feed samples submitted by the MRI Pharmacology and Toxicology Section of the Life Sciences Department

II. SAMPLE IDENTIFICATION

Mixing Date	Lot No.	Amount Received
9/7/83	13	∿ 50 g
9/7/83	14	∿ 50 g
9/7/83	15	∿ 50 g
9/7/83	16	∿ 50 g

III. ANALYSIS

These samples were analyzed in duplicate by a high performance liquid chromatographic method described previously by MRI Internal Report, "Chemical/Vehicle Studies of Disulfiram," dated October 4, 1982.

IV. RESULTS

	Disulfiram in Feed		
Lot No.	Label Conc. (%)	% Found	$\frac{\text{Found}}{\text{Label}}$ (%)
13	0.05	0.0467 0.0474 $\bar{x}$ = 0.0471 ± 0.0005(s)	$\bar{x}$ = 94.2 ± 1.0(s)
14	0.05	0.0470 0.0479 $\bar{x}$ = 0.0474 ± 0.0006(s)	$\bar{x}$ = 94.8 ± 1.3(s)

(continued)

	Disulfiram in Feed		Found (%)
Lot No.	Label Conc. (%)	% Found	Label
15	0.05	0.0481	
		0.0488	
		$\bar{x}$ = 0.0484 ± 0.0005(s)	$\bar{x}$ = 96.8 ± 1.0(s)
16	0.05	0.0471	
		0.0473	
		$\bar{x}$ = 0.0472 ± 0.0001(s)	$\bar{x}$ = 94.4 ± 0.3(s)

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute by Randy Peters.

MIDWEST RESEARCH INSTITUTE

Gustav Kuhn
Senior Chemist

Approved:

Evelyn Murrill for
E. J. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry Section

MIDWEST RESEARCH INSTITUTE
INTERNAL ANALYTICAL REPORT

October 10, 1983

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-E

I. PURPOSE

To determine the concentration of disulfiram in four dosed feed samples submitted by the MRI Pharmacology Toxicology Section of the Life Sciences Department.

II. SAMPLE IDENTIFICATION

Mixing Date	Sample No.	Amount Received
9/28/83	17	~ 50 g
9/28/83	18	~ 50 g
9/28/83	19	~ 50 g
9/28/83	20	~ 50 g

III. ANALYSIS

These samples were analyzed in duplicate by a high performance liquid chromatographic method described previously in MRI Internal Report "Chemical/Vehicle Studies of Disulfiram" dated October 4, 1982.

IV. RESULTS

	Disulfiram in Feed		
Lot No.	Label Conc (%)	% Found[a]	$\frac{\text{Found}}{\text{Label}}$ (%)
17	0.05	0.0495 0.0489 $\bar{x}$ = 0.0492 ± 0.0004(s)	$\bar{x}$ = 98.4 ± 0.8(s)
18	0.05	0.0499 0.0496 $\bar{x}$ = 0.0498 ± 0.0002(s)	$\bar{x}$ = 99.5 ± 0.4(s)
19	0.05	0.0503 0.0502 $\bar{x}$ = 0.0502 ± 0.0001(s)	$\bar{x}$ = 100.4 ± 0.1(s)
20	0.05	0.0497 0.0498 $\bar{x}$ = 0.0498 ± 0.0001(s)	$\bar{x}$ = 99.6 ± 0.1(s)

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[a] Results corrected for 96.1% recovery from feed.

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute by Randy Peters.

MIDWEST RESEARCH INSTITUTE

Gustav Kuhn
Senior Chemist

Approved:

E. J. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry Section

MIDWEST RESEARCH INSTITUTE
INTERNAL ANALYTICAL REPORT

November 3, 1983

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-E

I. PURPOSE

To determine the concentration of disulfiram in four dosed feed samples submitted by the MRI Pharmacoloy and Toxicology Section of the Life Sciences Department.

II. SAMPLE IDENTIFICATION

Mixing Date	Sample No.	Amount Received
10/25/83	21	~ 50 g
10/25/83	22	~ 50 g
10/25/83	23	~ 50 g
10/25/83	24	~ 50 g

III. ANALYSIS

These samples were analyzed in duplicate on October 27, 1983, using a high performance liquid chromatographic method described previously in MRI Internal Report "Chemical/Vehicle Studies of Disulfiram" dated October 4, 1982.

IV. RESULTS

	Disulfiram in Feed		
Lot No.	Label Conc (%)	% Found	$\frac{\text{Found}}{\text{Label}}$ (%)
21	0.05	0.0488	
		0.0481	
		$\bar{x}$ = 0.0484 ± 0.0005(s)	$\bar{x}$ = 96.9 ± 1.0(s)
22	0.05	0.0485	
		0.0487	
		$\bar{x}$ = 0.0486 ± 0.0001(s)	$\bar{x}$ = 97.2 ± 0.2(s)
23	0.05	0.0497	
		0.0493	
		$\bar{x}$ = 0.0495 ± 0.0003(s)	$\bar{x}$ = 99.0 ± 0.6(s)
24	0.05	0.0472	
		0.0482	
		$\bar{x}$ = 0.0477 ± 0.0007(s)	$\bar{x}$ = 95.4 ± 1.4(s)

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute by Randy Peters.

MIDWEST RESEARCH INSTITUTE

GKuhn

Gustav Kuhn
Senior Chemist

Approved:

E. J. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry Section

MIDWEST RESEARCH INSTITUTE
INTERNAL ANALYTICAL REPORT

January 3, 1984

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-E

I. PURPOSE

To determine the concentration of disulfiram in four dosed feed samples submitted by the MRI Pharmacology and Toxicology Section of the Life Sciences Department.

II. SAMPLE IDENTIFICATION

Mixing Date	Sample No.	Amount Received
11/17/83	25	~ 50 g
11/17/83	26	~ 50 g
11/17/83	27	~ 50 g
11/17/83	28	~ 50 g

III. ANALYSIS

These samples were analyzed in duplicate on November 22, 1983, using a high performance liquid chromatographic method described previously in MRI Internal Report "Chemical/Vehicle Studies of Disulfiram" dated October 4, 1982.

IV. RESULTS

	Disulfiram in Feed		
Lot No.	Label Conc (%)	% Found	Found / Label (%)
25	0.05	0.0476	
		0.0475	
		$\bar{x}$ = 0.0476 ± 0.0001(s)	$\bar{x}$ = 95.2 ± 0.2(s)
26	0.05	0.0487	
		0.0476	
		$\bar{x}$ = 0.0482 ± 0.0008(s)	$\bar{x}$ = 96.4 ± 1.6(s)
27	0.05	0.0480	
		0.0479	
		$\bar{x}$ = 0.0480 ± 0.0001(s)	$\bar{x}$ = 96.0 ± 0.2(s)
28	0.05	0.0487	
		0.0484	
		$\bar{x}$ = 0.0486 ± 0.0002(s)	$\bar{x}$ = 97.2 ± 0.4(s)

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute by David Kline.

MIDWEST RESEARCH INSTITUTE

Gustav Kuhn
Senior Chemist

Approved:

E. J. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry Section

MIDWEST RESEARCH INSTITUTE
INTERNAL ANALYTICAL REPORT

January 4, 1984

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-E

I. PURPOSE

To determine the concentration of disulfiram in three dosed feed samples submitted by the MRI Pharmacology and Toxicology Section of the Life Sciences Department.

II. SAMPLE IDENTIFICATION

Mixing Date	Sample No.	Amount Received
12/8/83	29	~ 50 g
12/8/83	30	~ 50 g
12/8/83	31	~ 50 g

III. ANALYSIS

These samples were analyzed in duplicate on December 13, 1983, using a high performance liquid chromatographic method described previously in MRI Internal Report "Chemical/Vehicle Studies of Disulfiram" dated October 4, 1982.

IV. RESULTS

	Disulfiram in Feed		
Lot No.	Label Conc (%)	% Found	Found/Label (%)
29	0.05	0.0489	
		0.0499	
		$\bar{x}$ = 0.0494 ± 0.0007(s)	$\bar{x}$ = 98.8 ± 1.4(s)
30	0.05	0.0466	
		0.0491	
		$\bar{x}$ = 0.0478 ± 0.0017(s)	$\bar{x}$ = 95.7 ± 3.5(s)
31	0.05	0.0499	
		0.0496	
		$\bar{x}$ = 0.0498 ± 0.0002(s)	$\bar{x}$ = 99.6 ± 0.4(s)

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute by Sheri Cox.

MIDWEST RESEARCH INSTITUTE

Gustav Kuhn
Senior Chemist

Approved:

E. J. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry Section

MIDWEST RESEARCH INSTITUTE
INTERNAL ANALYTICAL REPORT

January 5, 1984

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-E

I. PURPOSE

To determine the concentration of disulfiram in four dosed feed samples submitted by the MRI Pharmacology and Toxicology Section of the Life Sciences Department.

II. SAMPLE IDENTIFICATION

Mixing Date	Sample No.	Amount Received
12/30/83	32	~ 50 g
12/30/83	33	~ 50 g
12/30/83	34	~ 50 g
12/30/83	35	~ 50 g

III. ANALYSIS

These samples were analyzed in duplicate on January 3, 1984, using a high performance liquid chromatographic method described previously in MRI Internal Report "Chemical/Vehicle Studies of Disulfiram" dated October 4, 1982.

IV. RESULTS

	Disulfiram in Feed		
Lot No.	Label Conc (%)	% Found	$\frac{\text{Found}}{\text{Label}}$ (%)
32	0.05	0.0492 0.0497 $\bar{x}$ = 0.0494 ± 0.0004(s)	$\bar{x}$ = 98.8 ± 0.8(s)
33	0.05	0.0495 0.0494 $\bar{x}$ = 0.0494 ± 0.0001(s)	$\bar{x}$ = 98.8 ± 0.2(s)
34	0.05	0.0495 0.0503 $\bar{x}$ = 0.0499 ± 0.0006(s)	$\bar{x}$ = 99.8 ± 1.2(s)
35	0.05	0.0502 0.0501 $\bar{x}$ = 0.0501 ± 0.0001(s)	$\bar{x}$ = 100.2 ± 0.2(s)

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute by Tom Dux.

MIDWEST RESEARCH INSTITUTE

Gustav Kuhn
Senior Chemist

Approved:

E. J. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry Section

MIDWEST RESEARCH INSTITUTE
INTERNAL ANALYTICAL REPORT

February 9, 1984

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-E

I. PURPOSE

To determine the concentration of disulfiram in four dosed feed samples submitted by the MRI Pharmacology and Toxicology Section of the Life Sciences Department.

II. SAMPLE IDENTIFICATION

Mixing Date	Sample No.	Amount Received
1/23/83	36	~ 50 g
1/23/83	37	~ 50 g
1/23/83	38	~ 50 g
1/23/83	39	~ 50 g

III. ANALYSIS

These samples were analyzed in duplicate on January 25, 1984, using a high performance liquid chromatographic method described previously in MRI Internal Report "Chemical/Vehicle Studies of Disulfiram" dated October 4, 1982.

IV. RESULTS

	Disulfiram in Feed		
Lot No.	Label Conc (%)	% Found	Found/Label (%)
36	0.05	0.0497	
		0.0497	
		$\bar{x}$ = 0.0497 ± 0.0000	99.4 ± 0.0
37	0.05	0.0500	
		0.0500	
		$\bar{x}$ = 0.0500 ± 0.0000	100.0 ± 0.0
38	0.05	0.0504	
		0.0509	
		$\bar{x}$ = 0.0506 ± 0.0004	101.2 ± 0.8
39	0.05	0.0507	
		0.0509	
		$\bar{x}$ = 0.0508 ± 0.0001	101.6 ± 0.2

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute by Randy Peters.

MIDWEST RESEARCH INSTITUTE

GKuhn

Gustav Kuhn
Senior Chemist

Approved:

Evelyn Merrill for

E. J. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry Section

MIDWEST RESEARCH INSTITUTE
INTERNAL ANALYTICAL REPORT

March 1, 1984

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-E

I. PURPOSE

To determine the concentration of disulfiram in four dosed feed samples submitted by the MRI Pharmacology and Toxicology Section of the Life Sciences Department.

II. SAMPLE IDENTIFICATION

Mixing Date	Sample No.	Amount Received
2/13/83	40	~ 75 g
2/13/83	41	~ 75 g
2/13/83	42	~ 75 g
2/13/83	43	~ 75 g

III. ANALYSIS

These samples were analyzed in triplicate on February 16, 1984, using a high performance liquid chromatographic method described previously in MRI Internal Report "Chemical/Vehicle Studies of Disulfiram" dated October 4, 1982.

IV. RESULTS

	Disulfiram in Feed		
Lot No.	Label Conc (%)	% Found	$\frac{\text{Found}}{\text{Label}}$ (%)
40	0.05	-	-
		0.0483	
		0.0485	
		$\bar{x}$ = 0.0484 ± 0.0001	96.8 ± 0.3(s)
41	0.05	0.0487	
		0.0479	
		0.0473	
		$\bar{x}$ = 0.0480 ± 0.0007(s)	96.0 ± 1.4(s)
42	0.05	0.0492	
		0.0487	
		0.0495	
		$\bar{x}$ = 0.0491 ± 0.0004(s)	98.2 ± 0.8(s)
43	0.05	0.0489	
		0.0486	
		0.0492	
		$\bar{x}$ = 0.0489 ± 0.0003(s)	97.8 ± 0.6(s)

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute by Cheri Cox.

MIDWEST RESEARCH INSTITUTE

Gustav Kuhn
Senior Chemist

Approved:

E. J. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry Section

MIDWEST RESEARCH INSTITUTE
INTERNAL ANALYTICAL REPORT

March 20, 1984

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-E

I. PURPOSE

To determine the concentration of disulfiram in four dosed feed samples submitted by the MRI Pharmacology and Toxicology Section of the Life Sciences Department.

II. SAMPLE IDENTIFICATION

Mixing Date	Sample No.	Amount Received
3/8/84	44	∿ 75 g
3/8/84	45	∿ 75 g
3/8/84	46	∿ 75 g
3/8/84	47	∿ 75 g

III. ANALYSIS

These samples were analyzed in triplicate on March 13, 1984, using a high performance liquid chromatographic method described previously in MRI Internal Report "Chemical/Vehicle Studies of Disulfiram" dated October 4, 1982.

IV. RESULTS

	Disulfiram in Feed		
Lot No.	Label Conc (%)	% Found	$\frac{\text{Found}}{\text{Label}}$ (%)
44	0.05	0.0500	
		0.0495	
		0.0493	
		$\bar{x}$ = 0.0496 ± 0.0004(s)	99.2 ± 0.7(s)
45	0.05	0.0490	
		0.0502	
		0.0495	
		$\bar{x}$ = 0.0496 ± 0.0006(s)	99.2 ± 1.2(s)
46	0.05	0.0502	
		0.0495	
		0.0490	
		$\bar{x}$ = 0.0496 ± 0.0006(s)	99.2 ± 1.2(s)
47	0.05	0.0495	
		0.0488	
		0.0500	
		$\bar{x}$ = 0.0494 ± 0.0006(s)	98.8 ± 1.2(s)

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute.

MIDWEST RESEARCH INSTITUTE

allan Chatham

Allan Chatham
Junior Chemist

David H. Steele
Associate Chemist

Approved:

E. J. Woodhouse, Ph.D.
Head, Bioanalytical Chemistry Section

MIDWEST RESEARCH INSTITUTE
INTERNAL ANALYTICAL REPORT

April 18, 1984

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-E

I. PURPOSE

To determine the concentration of disulfiram in four dosed feed samples submitted by the MRI Pharmacology and Toxicology Section of the Life Sciences Department.

II. SAMPLE IDENTIFICATION

Mixing Date	Sample No.	Amount Received
4/5/84	48	~ 75 g
4/5/84	49	~ 75 g
4/5/84	50	~ 75 g
4/5/84	51	~ 75 g

III. ANALYSIS

These samples were analyzed in triplicate on April 11, 1984, using a high performance liquid chromatographic method described previously in MRI Internal Report "Chemical/Vehicle Studies of Disulfiram" dated October 4, 1982.

IV. RESULTS

	Disulfiram in Feed		
Lot No.	Label Conc (%)	% Found	$\frac{\text{Found}}{\text{Label}}$ (%)
48	0.05	0.0497	
		0.0485	
		0.0483	
		$\bar{x}$ = 0.0488 ± 0.0008(s)	97.6 ± 1.5(s)
49	0.05	0.0489	
		0.0499	
		0.0488	
		$\bar{x}$ = 0.0492 ± 0.0006(s)	98.4 ± 1.2(s)
50	0.05	0.0485	
		0.0486	
		0.0483	
		$\bar{x}$ = 0.0485 ± 0.0002(s)	97.0 ± 0.3(s)
51	0.05	0.0485	
		0.0488	
		0.0496	
		$\bar{x}$ = 0.0490 ± 0.0006(s)	98.0 ± 1.2(s)

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute.

MIDWEST RESEARCH INSTITUTE

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MIDWEST RESEARCH INSTITUTE
INTERNAL ANALYTICAL REPORT

May 21, 1984

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-A

I. PURPOSE

To determine the concentration of disulfiram in four dosed feed samples for use in the ethylene dichloride/disulfiram inhalation toxicology study currently being conducted at Deramus Field Station.

II. SAMPLE IDENTIFICATION

Mixing Date	Sample No.	Amount Received
5/10/84	52	~ 75 g
5/10/84	53	~ 75 g
5/10/84	54	~ 75 g
5/10/84	55	~ 75 g

III. ANALYSIS

These samples were analyzed in triplicate on May 11, 1984, using a high performance liquid chromatographic method described previously in MRI Internal Report "Chemical/Vehicle Studies of Disulfiram" dated October 4, 1982.

IV. RESULTS

	Disulfiram in Feed		
Lot No.	Label Conc (%)	% Found	$\frac{\text{Found}}{\text{Label}}$ (%)
52	0.05	0.0497	
		0.0500	
		0.0502	
		$\bar{x}$ = 0.0500 ± 0.0002(s)	100.0 ± 0.4(s)
53	0.05	0.0496	
		0.0505	
		0.0503	
		$\bar{x}$ = 0.0501 ± 0.0005(s)	100.2 ± 1.0(s)
54	0.05	0.0482	
		0.0483	
		0.0482	
		$\bar{x}$ = 0.0482 ± 0.00006(s)	96.4 ± 0.1(s)
55	0.05	0.0483	
		0.0485	
		0.0482	
		$\bar{x}$ = 0.0483 ± 0.0002(s)	96.6 ± 0.4(s)

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute.

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MIDWEST RESEARCH INSTITUTE
INTERNAL ANALYTICAL REPORT

June 20, 1984

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-A

I. PURPOSE

To determine the concentration of disulfiram in four dosed feed samples for use in the ethylene dichloride/disulfiram inhalation toxicology study currently being conducted at Deramus Field Station.

II. SAMPLE IDENTIFICATION

Mixing Date	Sample No.	Amount Received
6/7/84	56	~ 75 g
6/7/84	57	~ 75 g
6/7/84	58	~ 75 g
6/7/84	59	~ 75 g

III. ANALYSIS

These samples were analyzed in triplicate on June 14, 1984, using a high performance liquid chromatographic method described previously in MRI Internal Report "Chemical/Vehicle Studies of Disulfiram" dated October 4, 1982.

IV. RESULTS

	Disulfiram in Feed		
Lot No.	Label Conc (%)	% Found	$\frac{\text{Found}}{\text{Label}}$ (%)
56	0.05	0.0498	
		0.0505	
		0.0505	
		$\bar{x}$ = 0.0503 ± 0.0004(s)	100.6 ± 0.8(s)
57	0.05	0.0500	
		0.0496	
		0.0504	
		$\bar{x}$ = 0.0500 ± 0.0004(s)	100.0 ± 0.8(s)
58	0.05	0.0505	
		0.0494	
		0.0507	
		$\bar{x}$ = 0.0502 ± 0.0007(s)	100.4 ± 1.4(s)
59	0.05	0.0506	
		0.0495	
		0.0505	
		$\bar{x}$ = 0.0502 ± 0.0006(s)	100.4 ± 1.2(s)

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute.

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MIDWEST RESEARCH INSTITUTE
INTERNAL ANALYTICAL REPORT

July 24, 1984

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-A

I. PURPOSE

To determine the concentration of disulfiram in four dosed feed samples for use in the ethylene dichloride/disulfiram inhalation toxicology study currently being conducted at Deramus Field Station.

II. SAMPLE IDENTIFICATION

Mixing Date	Sample No.	Amount Received
7/11/84	60	~ 75 g
7/11/84	61	~ 75 g
7/11/84	62	~ 75 g
7/11/84	63	~ 75 g

III. ANALYSIS

These samples were analyzed in triplicate on July 16, 1984, using a high performance liquid chromatographic method described previously in MRI Internal Report "Chemical/Vehicle Studies of Disulfiram" dated October 4, 1982.

IV. RESULTS

	Disulfiram in Feed		
Lot No.	Label Conc (%)	% Found	$\frac{\text{Found}}{\text{Label}}$ (%)
60	0.05	0.0493	
		0.0482	
		0.0478	
		$\bar{x}$ = 0.0484 ± 0.0008(s)	96.8 ± 1.6(s)
61	0.05	0.0479	
		0.0476	
		0.0475	
		$\bar{x}$ = 0.0477 ± 0.0002(s)	95.4 ± 0.4(s)
62	0.05	0.0465	
		0.0467	
		0.0468	
		$\bar{x}$ = 0.0467 ± 0.0002(s)	93.4 ± 0.4(s)
63	0.05	0.0482	
		0.0490	
		0.0492	
		$\bar{x}$ = 0.0488 ± 0.0005(s)	97.6 ± 1.0(s)

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute.

MIDWEST RESEARCH INSTITUTE

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MIDWEST RESEARCH INSTITUTE
INTERNAL ANALYTICAL REPORT

August 21, 1984

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-A

I. PURPOSE

To determine the concentration of disulfiram in four dosed feed samples for use in the ethylene dichloride/disulfiram inhalation toxicology study currently being conducted at Deramus Field Station.

II. SAMPLE IDENTIFICATION

Mixing Date	Sample No.	Amount Received
8/9/84	64	~ 75 g
8/9/84	65	~ 75 g
8/9/84	66	~ 75 g
8/9/84	67	~ 75 g

III. ANALYSIS

These samples were analyzed in triplicate on August 14, 1984, using a high performance liquid chromatographic method described previously in MRI Internal Report "Chemical/Vehicle Studies of Disulfiram" dated October 4, 1982.

IV. RESULTS

	Disulfiram in Feed		
Lot No.	Label Conc (%)	% Found	Found / Label (%)
64	0.05	0.0476	
		0.0500	
		0.0496	
		$\bar{x}$ = 0.0491 ± 0.0012(s)	98.2 ± 2.4(s)
65	0.05	0.0458	
		0.0494	
		0.0490	
		$\bar{x}$ = 0.0481 ± 0.0020(s)	96.2 ± 4.0(s)
66*	0.05	0.0419	
		0.0433	
		0.0428	
		$\bar{x}$ = 0.0427 ± 0.0007(s)	85.4 ± 1.7(s)
67	0.05	0.0482	
		0.0510	
		0.0504	
		$\bar{x}$ = 0.0499 ± 0.0015(s)	99.8 ± 3.0(s)

---

* This lot of disulfiram/feed mix was not within the specifications required for use on this program (0.05 ± 0.005%).

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute.

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MIDWEST RESEARCH INSTITUTE
INTERNAL ANALYTICAL REPORT

September 26, 1984

ANALYSIS FOR DISULFIRAM IN FEED SAMPLES - MRI PROJECT NO. 7452-A

I. PURPOSE

To determine the concentration of disulfiram in two dosed feed samples for use in the ethylene dichloride/disulfiram inhalation toxicology study currently being conducted at Deramus Field Station.

II. SAMPLE IDENTIFICATION

Mixing Date	Sample No.	Amount Received
9/5/84	68	~ 75 g
9/5/84	69	~ 75 g

III. ANALYSIS

These samples were analyzed in triplicate on August 14, 1984, using a high performance liquid chromatographic method described previously in MRI Internal Report "Chemical/Vehicle Studies of Disulfiram" dated October 4, 1982.

IV. RESULTS

	Disulfiram in Feed		
Lot No.	Label Conc (%)	% Found	$\frac{\text{Found}}{\text{Label}}$ (%)
68*	0.05	0.0561	
		0.0539	
		0.0543	
		$\bar{x}$ = 0.0548 ± 0.0012(s)	109.6 ± 2.2(s)
69	0.05	0.0490	
		0.0479	
		0.0459	
		$\bar{x}$ = 0.0476 ± 0.0016(s)	95.2 ± 3.4(s)

---

* This lot of disulfiram/feed mix was originally analyzed as Lot No. 66 (see MRI Internal Report "Analysis of Disulfiram in Feed Samples" dated August 21, 1984). Because the concentration of disulfiram from this original lot was found to be 85.4 ± 1.7(s)% of the target concentration, Lot No. 66 was remixed and additional disulfiram added to increase the concentration. The results of the analysis of this new lot (Lot No. 68) are described above. Although this lot of disulfiram/feed mix was within the specifications required for use on this program, its use was not required due to the completion of the study.

This analysis was conducted in the Bioanalytical Chemistry Section of Midwest Research Institute.

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APPENDIX 4

SPECIAL STUDIES

- EDC Quality Control Sample Analyses, 4/29/83
- EDC Quality Control Sample Analyses, 1/3/84
- EDC Quality Control Sample Analyses, 9/5/84
- Validation of the Dräger Method for Ammonia Sampling
- Determination of the Stability of Ethanolic Drinking Water in the Chamber Water Delivery System
- Evaluation of EDC Standardization Data to Determine Statistical Outliers
- Analysis of Disulfiram Feed Sample
- Validation of the Autosampling System
- Chamber Distribution Study

INTERNAL ANALYTICAL REPORT
April 29, 1983

ETHYLENE DICHLORIDE QUALITY CONTROL SAMPLE ANALYSIS

MRI Project No. 7452-E

I. Purpose

Beginning with the start of the chronic phase of the ethylene dichloride inhalation study (September 27, 1982), one quality control sample has been supplied to the field station staff each month. The quality control sample, containing ethylene dichloride at a concentration unknown to the field station staff, is analyzed and the results reported to the chemist. The purpose of these samples is to check the accuracy of the instrument operators and of the instrument system itself.

II. Analysis

The quality control samples are analyzed using the same gas chromatographic system that is used to routinely monitor chamber atmosphere concentrations. The samples are injected with the system in the chamber mode, and the results computed in parts per million.

III. Results

The results for the quality control samples analyzed to date are presented in tabular form below.

Quality Control Sample No.	Date	Theory (ppm) (T)	Determined (ppm) (D)	Difference From Theoretical (D-T)	% $\overline{D}$/T
2	10-28-82	71.44	67.17	-4.27	94.0
3	12-2-82	71.44	65.20	-6.24	91.3
4	12-30-82	71.44	72.70	+1.26	101.8
5	1-6-83	35.72	36.50	+0.78	102.2
6	2-3-83	71.44	72.90	+1.46	102.0
7	3-3-83	57.16	56.70	-0.46	99.2
8	3-31-83	57.16	55.25	-1.91	96.6

Average = 98.2 ± 4.3(s)%

IV. Conclusions

The values obtained were found to be in good agreement with theoretical values. The average for the eight samples was found to be 98.2 ± 4.3(s)%.

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INTERNAL ANALYTICAL REPORT
January 3, 1984

ETHYLENE DICHLORIDE QUALITY CONTROL SAMPLE ANALYSIS

MRI Project No. 7452-E

I. Purpose

Beginning with the start of the chronic phase of the ethylene dichloride inhalation study (September 27, 1982), one quality control sample has been supplied to the field station staff each month. The quality control sample, containing ethylene dichloride at a concentration unknown to the field station staff, is analyzed and the results reported to the chemist. The purpose of these samples is to check the accuracy of the instrument operators and of the instrument system itself.

II. Analysis

The quality control samples are analyzed using the same gas chromatographic system that is used to routinely monitor chamber atmosphere concentrations. The samples are injected with the system in the chamber mode, and the results computed in parts per million.

III. Results

The results for the quality control samples analyzed to date are presented in tabular form below.

Quality Control Sample No.	Date	Theory (ppm) (T)	Determined (ppm) ($\bar{D}$)	Difference From Theoretical ($\bar{D}$-T)	% $\bar{D}$/T
2	10-28-82	71.44	67.17	-4.27	94.0
3	12-2-82	71.44	65.20	-6.24	91.3
4	12-30-82	71.44	72.70	+1.26	101.8
5	1-6-83	35.72	36.50	+0.78	102.2
6	2-3-83	71.44	72.90	+1.46	102.0
7	3-3-83	57.16	56.70	-0.46	99.2
8	3-31-83	57.16	55.25	-1.91	96.6
9	4-28-83	57.16	56.10	-1.06	98.1
10	5-26-83	57.16	58.83	+1.67	102.9
11	6-30-83	57.16	55.40	-1.76	96.9
12	7-29-83	57.16	51.65	-5.51	90.4
13	8-25-83	57.16	55.93	-1.23	97.8
14	9-29-83	57.16	56.20	-0.96	98.3
14	12-15-83	57.16	56.70	-0.46	99.2

Average = 97.9 ± 3.9(s)%

IV. Conclusions

The values obtained were found to be in good-agreement with theoretical values. The average for the 14 samples was found to be 97.9 ± 3.9(s)%.

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INTERNAL ANALYTICAL REPORT
September 5, 1984

ETHYLENE DICHLORIDE QUALITY CONTROL SAMPLE ANALYSIS
MRI Project No. 7452-A

I. PURPOSE

Beginning with the start of the chronic phase of the ethylene dichloride inhalation study (September 27, 1982), one quality control sample has been supplied to the field station staff each month. The quality control sample, containing ethylene dichloride at a concentration unknown to the field station staff, is analyzed and the results reported to the chemist. The purpose of these samples is to check the accuracy of the instrument operators and of the instrument system itself.

II. ANALYSIS

The quality control samples are analyzed using the same gas chromatographic system that is used to routinely monitor chamber atmosphere concentrations. The samples are injected with the system in the chamber mode, and the results computed in parts per million.

III. RESULTS

The results for the quality control samples analyzed to date are presented in tabular form below.

Quality Control Sample No.	Date	Theory (ppm) (T)	Determined (ppm) ($\bar{D}$)	Difference From Theoretical ($\bar{D}$-T)	% $\bar{D}$/T
2	10/28/82	71.44	67.17	-4.27	94.0
3	12/2/82	71.44	65.20	-6.24	91.3
4	12/30/82	71.44	72.70	+1.26	101.8
5	1/6/83	35.72	36.50	+0.78	102.2
6	2/3/83	71.44	72.90	+1.46	102.0
7	3/3/83	57.16	56.70	-0.46	99.2
8	3/31/83	57.16	55.25	-1.91	96.6
9	4/28/83	57.16	56.10	-1.06	98.1
10	5/26/83	57.16	58.83	+1.67	102.9
11	6/30/83	57.16	55.40	-1.76	96.9
12	7/29/83	57.16	51.65	-5.51	90.4
13	8/25/83	57.16	55.93	-1.23	97.8
14	9/29/83	57.16	56.20	-0.96	98.3
15	12/15/83	57.16	56.70	-0.46	99.2
16	1/10/84	57.16	57.50	+0.34	100.6
17	2/22/84	42.87	43.40	+0.53	101.2
18	3/28/84	42.87	42.70	-0.17	99.6
19	5/2/84	57.16	56.06	-1.10	98.1
20	6/13/84	42.87	42.52	-0.35	99.2
21	8/8/84	57.16	62.04	+4.88	108.5
22	9/5/84	42.87	43.54	+0.67	101.6

Average = 99.0 ± 4.0(s)%.

IV. CONCLUSIONS

The values obtained were found to be in good agreement with theoretical values. The average for the 21 samples was found to be 99.0 ± 4.0(s)%.

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INTERNAL ANALYTICAL REPORT

Project No. 7801-E

December 22, 1983

VALIDATION OF THE DRÄGER METHOD FOR AMMONIA SAMPLING

I. Purpose

The purpose of this work is to demonstrate the accuracy of the Dräger method[1] for measuring ammonia levels in inhalation test atmospheres.

II. Analysis

A. Method

Atmospheres of known ammonia concentration were prepared in gas sampling bags by adding accurately measured amounts of aqueous ammonium hydroxide (29.0%) to known volumes of room air and control chamber atmosphere. After allowing sufficient time to ensure total evaporation of the ammonium hydroxide, these standards were analyzed using the Dräger method.

B. Results

The results are presented in tabular form below. Both the standards prepared with room air and the standards prepared with control chamber atmosphere yielded linear relationships with correlation coefficients of 0.9994 and 0.9951, respectively. In addition, the lines obtained were parallel, with the difference in the y-intercepts indicating the presence of a background ammonia level in the control chamber of approximately 0.7 ppm. Although the values obtained are slightly low, they fall within the range cited for the method (± 15%).

1. Room Air Standard Curve

Theoretical Concentration (ppm)	Measured Concentration (ppm)
0	0
4.4	4
17.6	15
35.2	29
44.0	38

Y = 1.18X - 0.032 corr: 0.9994

---

[1] Leichnitz, K. (Ed.), "Air Investigations and Technical Gas Analysis with Dräger Tubes," 4th Edition, August 1979, Drägerwerk Ag Lubeck, p. 25.

2. Control Chamber Atmosphere Standard Curve

Theoretical Concentration (ppm)	Measured Concentration (ppm)
0	< 2*
4.4	4
8.8	8
17.6	18
35.2	31

$Y = 1.12X - 0.67$ corr: 0.9951

---

* This reading was below the calibrated range for the method and was not used for calculation.

III. Conclusions

Analysis for ammonia in inhalation test atmospheres using the Dräger method was validated using standards prepared in room air and in control chamber atmosphere. This demonstrates that ammonia levels are being accurately measured, within the limits of error (± 15%) of the method.

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INTERNAL ANALYTICAL REPORT
MRI Project No. 7452-E
January 9, 1984

DETERMINATION OF THE STABILITY OF ETHANOLIC DRINKING WATER IN THE CHAMBER WATER DELIVERY SYSTEM

I. Purpose

The analysis was conducted to determine if the ethanol concentration was altered by the delivery system.

II. Discussion

In this study, an automated system was used to deliver ethanolic drinking water (5%) to the test animals. The system was slightly pressurized and provided water to the animals on demand via sipper tubes located in each cage. Because the only contact with the atmosphere is the air-water interface at the end of the sipper tubes, no transmission losses would be expected to occur.

III. Analysis

A. Method

A sample of the ethanolic drinking water, which had been placed in the delivery system on November 8, 1983, was removed from a sipper tube in the ethanol control chamber on November 21, 1983. The sample was then analyzed for ethanol concentration using the same gas chromatographic method employed for the original concentration determination (11/7/83). The concentration obtained was compared to the concentration obtained during the original analysis.

B. System

Instrument: Varian 920 gas chromatograph
Detection: Thermal conductivity
Column: 100/120 mesh Chromosorb 105; 3.0 m x 2 mm ID, nickel
Carrier Gas: Helium
Carrier Gas Flow Rate: 30 cc/min
Reference Cell Flow Rate: 30 cc/min
Inlet Temperature: 250°C
Detector Temperature: 250°C
Column Oven Temperature: 170°C, isothermal
Filament Current: 150 mA
Samples Injected: 1 µL injections of the ethanolic drinking water and of aqueous ethanol standards (5.7 and 3.8% v/v)

C. Results

Using this method, the ethanol concentration of a sample which had been in the delivery system for a period of 2 weeks was not found to be significantly different, within experimental error, from the concentration of the freshly prepared material. The data obtained are presented in tabular form below.

Analysis Date	Concentration (%)	
11/7/83	5.00 ± 0.063(s)	n = 5
11/21/83	5.12 ± 0.23(s)	n = 3

% of original analysis: 102.45%

IV. Conclusion

The results obtained indicated that ethanolic drinking water is stable in the water delivery system for a period of 2 weeks.

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MIDWEST RESEARCH INSTITUTE
Internal Report
MRI Project No. 7452-A
October 4, 1984

EVALUATION OF EDC STANDARDIZATION DATA TO DETERMINE STATISTICAL OUTLIERS

I. PURPOSE

To correct the EDC chamber concentration data for differences in the average calibration factor used for the Varian CDS-111 integrator.

II. BACKGROUND AND DISCUSSION

Prior to the start of each 6-hr exposure, liquid standards containing known amounts of EDC in hexane were injected (duplicates at two different concentrations) into the gas chromatographic monitoring system. A calibration factor (Cal Fact), was generated by the Varian CDS-111 integrator for each of the liquid standards injected. The average of these values and the standard deviation were independently computed. The standardization was considered adequate if the coefficient of variation was < 6%. If the standardization did not meet this criteria, the standards were reinjected until the criteria was satisfied. The average Cal Fact value was then placed in a line program of the integrator and was used to calculate actual EDC chamber concentrations.

On certain days, some of the Cal Fact values were not used to calculate the average Cal Fact value. Since a statistical procedure was not used for rejecting these data points, it was necessary to review the entire standardization data to determine statistically which Cal Fact values were outliers.

The standardization data was evaluated using the Tietjen-Moore equation[1] for determining statistical outliers occurring on one or both sides of the mean. If Cal Fact values were determined to be outliers, these values were rejected and a new average Cal Fact value was calculated. Each chamber concentration reading obtained during the exposure period was then recalculated using this new value.

---

[1] Tietjen, G. L., and R. H. Moore, Some Grubbs-Type Statistics for the Detection of Several Outliers, Technometrics, TCNTA, Vol. 14, No. 3, August 1972, pp. 583-597.

III. CORRECTION OF DATA

A. Method

A computer program written at MRI using the Tietjen-Moore equation was used to evaluate the standardization data for statistical outliers. This equation is shown below. A Tietjen-Moore statistical value (E_K) was calculated and compared to a critical value table to determine if the suspected outlier could be rejected. All of the standardization data were evaluated at the 90% confidence level.

$$E_K = \left[\sum_{i=1}^{n-k} (Z_i - \bar{Z}_K)^2 / \sum_{i=1}^{n} (Z_i - \bar{Z})^2 \right]$$

where E_K = Tietjen-Moore statistic
$\bar{Z}$ = mean of full sample
n = number of observations
t = number of suspected outliers
Z_i = individual observation
$\bar{Z}_K = \sum_{i=1}^{n-k} Z_i/(n-k)$

The data were corrected by multiplying individual chamber concentration readings by a correction factor (recalculated average Cal Fact/old average Cal Fact). A new mean and standard deviation were then calculated.

B. Results

Review of the morning standardization data indicated 76 days where EDC chamber concentration data needed to be corrected. All of these days fell between 12/27/82 and 10/3/83. The corrected and uncorrected versions of the data for each chamber (EDC/DS, EDC, EDC/ET), along with the percent difference are presented in Appendix A. The average percent difference for the 76 days were found to be +3.91 ± 6.1(s)%, +3.80 ± 6.2(s)%, and +3.99 ± 6.0(s)% for the EDC/DS, EDC, and EDC/ET chambers respectively.

IV. CONCLUSIONS

EDC chamber concentration data (for 76 days between 12/27/82 to 10/3/83) were corrected for differences in the average Cal Fact values used by the Varian CDS-111 integrator to calculate the EDC concentrations.

The average percent difference for the 76 days were found to be +3.91 ± 6.1(s)%, +3.80 ± 6.2(s)% and +3.99 ± 6.0(s)% for the EDC/DS, EDC, and EDC/ET chambers respectively.

Since there were 495 exposure days for each chamber, the overall effect of these corrections on the study mean is minimal.

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APPENDIX A

EDC/DS

Date	Exposure Day	Daily Mean		% Difference
		Uncorrected	Corrected	
12/28/82	62	50.6 ± 1.25	51.9 ± 1.27	+2.6
12/29/82	63	51.0 ± 1.20	54.7 ± 1.34	+7.2
12/30/82	64	50.3 ± 0.89	51.0 ± 0.89	+1.4
1/3/83	65	49.8 ± 1.85	48.9 ± 1.84	-1.8
1/4/83	66	51.1 ± 1.28	51.6 ± 1.30	+1.0
1/6/83	68	52.9 ± 1.02	49.3 ± 0.94	-6.8
1/7/83	69	51.9 ± 0.90	53.5 ± 0.94	+3.1
1/10/83	70	50.0 ± 1.05	51.1 ± 1.05	+2.2
1/11/83	71	50.8 ± 1.87	59.7 ± 2.21	+17.5
1/12/83	72	52.3 ± 2.49	56.7 ± 2.68	+8.4
1/13/83	73	51.4 ± 2.75	54.0 ± 2.87	+5.0
1/14/83	74	49.7 ± 3.06	50.0 ± 3.06	+0.6
1/17/83	75	49.2 ± 2.96	47.6 ± 2.87	-3.3
1/18/83	76	50.2 ± 1.95	51.9 ± 2.02	+3.4
1/19/83	77	50.5 ± 0.67	52.0 ± 0.73	+3.0
1/20/83	78	50.2 ± 0.68	50.9 ± 0.68	+1.4
1/21/83	79	50.1 ± 1.03	53.7 ± 1.10	+7.2
1/24/83	80	50.6 ± 0.53	51.8 ± 0.56	+2.4
1/25/83	81	49.6 ± 1.76	47.9 ± 1.73	-3.4
1/27/83	83	49.7 ± 0.99	54.1 ± 1.10	+8.8
1/28/83	84	50.3 ± 1.47	52.1 ± 1.52	+3.6
1/31/83	85	51.4 ± 1.81	52.5 ± 1.85	+2.1
2/2/83	87	49.8 ± 1.19	49.1 ± 1.17	-1.4
2/8/83	91	50.1 ± 1.54	51.2 ± 1.51	+2.2
2/25/83	103	49.8 ± 1.35	48.9 ± 1.30	-1.8
3/2/83	106	49.9 ± 2.10	50.8 ± 2.04	+1.8
3/9/83	111	50.5 ± 2.20	49.2 ± 2.16	-2.6
3/10/83	112	49.1 ± 2.96	51.7 ± 3.14	+5.3
3/11/83	113	51.9 ± 1.89	53.0 ± 1.92	+2.1
3/16/83	116	45.7 ± 2.05	46.4 ± 2.06	+1.5
4/11/83	134	51.7 ± 1.79	53.0 ± 1.83	+2.5
4/26/83	145	51.4 ± 1.92	49.7 ± 1.86	-3.3
4/29/83	148	50.8 ± 1.25	51.8 ± 1.29	+2.0
5/2/83	149	52.1 ± 1.40	52.3 ± 1.42	+0.4
5/3/83	150	50.2 ± 0.95	48.9 ± 0.94	-2.6
5/5/83	152	51.5 ± 2.65	53.7 ± 2.76	+4.3
5/11/83	156	48.8 ± 1.19	51.1 ± 1.25	+4.7
5/13/83	158	50.0 ± 1.54	51.6 ± 1.60	+3.2
5/16/83	159	52.0 ± 3.21	51.6 ± 3.18	-0.8
6/20/83	182	50.0 ± 2.54	50.5 ± 2.58	+1.0
6/21/83	183	50.5 ± 1.75	48.3 ± 1.67	-4.4
6/22/83	184	48.8 ± 1.58	51.2 ± 1.65	+4.9
7/1/83	191	51.2 ± 1.67	53.1 ± 1.73	+3.7
7/5/83	192	47.3 ± 1.35	48.5 ± 1.41	+2.5
7/7/83	194	50.4 ± 1.54	51.4 ± 1.59	+2.0

EDC/DS (concluded)

Date	Exposure Day	Daily Mean		% Difference
		Uncorrected	Corrected	
7/12/83	197	50.3 ± 1.17	54.6 ± 1.28	+8.5
7/13/83	198	49.1 ± 1.04	49.0 ± 1.04	-0.2
7/15/83	200	48.5 ± 1.64	54.4 ± 1.84	+12.2
7/29/83	210	49.7 ± 1.40	51.0 ± 1.44	+2.6
8/1/83	211	51.1 ± 2.05	48.6 ± 1.94	-4.9
8/4/83	214	50.8 ± 0.99	54.0 ± 1.06	+6.3
8/8/83	216	50.5 ± 1.30	63.6 ± 1.64	+25.9
8/9/83	217	49.3 ± 1.69	59.2 ± 2.03	+20.1
8/10/83	218	50.9 ± 1.39	58.0 ± 1.60	+13.9
8/11/83	219	48.8 ± 1.41	56.2 ± 1.60	+15.2
8/12/83	220	49.7 ± 1.02	59.6 ± 1.23	+19.9
8/16/83	222	49.3 ± 1.35	50.0 ± 1.38	+1.4
8/17/83	223	49.4 ± 1.66	47.8 ± 1.60	-3.2
8/19/83	225	50.4 ± 1.66	53.8 ± 1.78	+6.7
8/22/83	226	50.9 ± 1.54	53.5 ± 1.62	+5.1
8/23/83	227	50.0 ± 1.53	56.1 ± 1.73	+12.2
8/24/83	228	50.0 ± 1.41	52.2 ± 1.47	+4.4
8/26/83	230	49.8 ± 0.83	47.6 ± 0.79	-4.4
8/29/83	231	48.6 ± 1.27	51.7 ± 1.36	+6.4
8/30/83	232	49.4 ± 2.03	53.0 ± 2.18	+7.3
9/1/83	234	51.5 ± 3.23	55.3 ± 3.45	+7.4
9/6/83	236	48.7 ± 3.12	47.5 ± 3.04	-2.5
9/7/83	237	50.2 ± 0.47	57.4 ± 0.53	+14.3
9/8/83	238	50.9 ± 1.72	53.2 ± 1.81	+4.5
9/13/83	241	51.5 ± 1.78	50.9 ± 1.78	-1.2
9/19/83	245	51.9 ± 0.69	57.9 ± 0.78	+11.6
9/20/83	246	50.3 ± 0.88	52.6 ± 0.93	+4.6
9/22/83	248	50.0 ± 0.87	51.2 ± 0.90	+2.4
9/26/83	250	51.9 ± 1.31	53.8 ± 1.36	+3.7
9/29/83	253	50.1 ± 0.92	51.1 ± 0.94	+2.0
10/3/83	255	50.6 ± 1.27	51.8 ± 1.31	+2.4
				3.91 ± 6.10(s)%

EDC

Date	Exposure Day	Daily Mean		% Difference
		Uncorrected	Corrected	
12/28/82	62	49.2 ± 1.56	50.5 ± 1.59	+2.6
12/29/82	63	51.4 ± 0.90	55.1 ± 0.93	+7.2
12/30/82	64	50.7 ± 1.14	51.4 ± 1.17	+1.4
1/3/83	65	50.0 ± 1.08	49.1 ± 1.06	-1.8
1/4/83	66	50.7 ± 1.08	51.2 ± 1.11	+1.0
1/6/83	68	50.6 ± 1.22	47.2 ± 1.11	-6.7
1/7/83	69	50.8 ± 1.05	52.4 ± 1.06	+3.1
1/10/83	70	49.4 ± 1.80	50.4 ± 1.84	+2.0
1/11/83	71	50.1 ± 0.89	58.9 ± 1.04	+17.6
1/12/83	72	50.9 ± 1.81	55.3 ± 1.97	+8.6
1/13/83	73	50.9 ± 2.99	53.5 ± 3.13	+5.1
1/14/83	74	51.9 ± 4.18	52.2 ± 4.19	+0.6
1/17/83	75	49.9 ± 2.49	48.4 ± 2.39	-3.0
1/18/83	76	50.1 ± 0.82	51.8 ± 0.85	+3.4
1/19/83	77	50.1 ± 0.60	51.6 ± 0.75	+3.0
1/20/83	78	50.7 ± 1.14	51.4 ± 1.14	+1.3
1/21/83	79	50.4 ± 1.94	53.9 ± 2.09	+6.9
1/24/83	80	48.9 ± 2.20	50.1 ± 2.24	+2.4
1/25/83	81	49.3 ± 0.70	47.6 ± 0.68	-3.4
1/27/83	83	49.9 ± 0.71	54.3 ± 0.77	+8.8
1/28/83	84	49.8 ± 1.57	51.5 ± 1.59	+3.4
1/31/83	85	51.0 ± 1.27	52.1 ± 1.30	+2.2
2/2/83	87	49.4 ± 0.99	48.7 ± 0.99	-1.4
2/8/83	91	50.1 ± 3.02	51.1 ± 3.08	+2.0
2/25/83	103	49.7 ± 0.83	48.7 ± 0.80	-2.0
3/2/83	106	50.5 ± 1.26	51.5 ± 1.28	+2.0
3/9/83	111	49.6 ± 1.95	48.3 ± 1.90	-2.6
3/10/83	112	49.4 ± 1.23	52.0 ± 1.31	+5.3
3/11/83	113	48.9 ± 1.05	49.9 ± 1.08	+2.0
3/16/83	116	50.6 ± 2.83	51.4 ± 2.87	+1.6
4/11/83	134	51.2 ± 1.03	52.5 ± 1.05	+2.5
4/26/83	145	49.6 ± 2.21	48.0 ± 2.14	-3.2
4/29/83	148	48.5 ± 2.97	49.4 ± 3.03	+1.8
5/2/83	149	48.2 ± 2.82	48.4 ± 2.84	+0.4
5/3/83	150	48.4 ± 2.08	47.2 ± 2.03	-2.5
5/5/83	152	45.9 ± 13.9	47.9 ± 14.5	-4.4
5/11/83	156	47.4 ± 4.97	49.7 ± 5.21	+4.8
5/13/83	158	51.3 ± 3.10	52.9 ± 3.18	+3.1
5/16/83	159	56.4 ± 7.32	56.0 ± 7.28	-0.7
6/20/83	182	49.3 ± 3.09	49.8 ± 3.13	+1.0
6/21/83	183	48.9 ± 1.74	46.7 ± 1.66	-4.5
6/22/83	184	49.2 ± 2.25	51.6 ± 2.35	+4.9
7/1/83	191	49.2 ± 2.95	51.0 ± 3.05	+3.6
7/5/83	192	48.9 ± 1.33	50.0 ± 1.36	+2.2
7/7/83	194	49.7 ± 2.03	50.7 ± 2.06	+2.0

EDC (concluded)

Date	Exposure Day	Daily Mean Uncorrected	Daily Mean Corrected	% Difference
7/12/83	197	50.1 ± 1.65	54.4 ± 1.78	+8.6
7/13/83	198	49.8 ± 1.92	49.7 ± 1.92	-0.2
7/15/83	200	50.9 ± 1.41	57.0 ± 1.58	+12.0
7/29/83	210	51.1 ± 1.40	52.5 ± 1.43	+2.7
8/1/83	211	51.1 ± 1.87	48.6 ± 1.78	-4.9
8/4/83	214	50.9 ± 1.51	54.3 ± 1.35	+6.7
8/8/83	216	48.4 ± 0.57	61.0 ± 0.71	+26.0
8/9/83	217	50.5 ± 0.88	60.6 ± 1.06	+20.0
8/10/83	218	51.3 ± 1.32	58.6 ± 1.50	+14.2
8/11/83	219	49.2 ± 2.17	56.7 ± 2.48	+15.2
8/12/83	220	50.1 ± 1.64	60.0 ± 1.96	+19.8
8/16/83	222	50.0 ± 1.42	50.7 ± 1.43	+1.4
8/17/83	223	49.0 ± 0.97	47.4 ± 0.94	-3.3
8/19/83	225	49.6 ± 2.71	52.9 ± 2.89	+6.6
8/22/83	226	49.4 ± 0.97	51.9 ± 1.02	+5.1
8/23/83	227	49.9 ± 2.09	56.0 ± 2.35	+12.2
8/24/83	228	50.1 ± 1.17	52.3 ± 1.24	+4.4
8/26/83	230	49.7 ± 1.43	47.5 ± 1.37	-4.4
8/29/83	231	49.8 ± 1.27	53.0 ± 1.34	+6.4
8/30/83	232	48.5 ± 0.84	52.0 ± 0.91	+7.2
9/1/83	234	51.2 ± 1.98	55.0 ± 2.12	+7.4
9/6/83	236	49.1 ± 1.69	48.0 ± 1.60	-2.2
9/7/83	237	50.0 ± 1.37	57.3 ± 1.57	+14.6
9/8/83	238	50.3 ± 2.67	52.5 ± 2.80	+4.4
9/13/83	241	49.6 ± 2.60	49.0 ± 2.58	-1.2
9/19/83	245	50.1 ± 1.69	55.8 ± 1.88	+11.4
9/20/83	246	48.9 ± 1.20	51.1 ± 1.26	+4.5
9/22/83	248	50.8 ± 0.52	52.0 ± 0.52	+2.4
9/26/83	250	51.2 ± 1.22	53.0 ± 1.28	+3.5
9/29/83	253	49.5 ± 1.96	50.5 ± 1.99	+2.0
10/3/83	255	50.7 ± 1.22	51.9 ± 1.26	+2.4
				3.80 ± 6.17(s)%

EDC/ET

Date	Exposure Day	Daily Mean Uncorrected	Daily Mean Corrected	% Difference
12/28/82	62	49.0 ± 1.60	50.3 ± 1.64	+2.6
12/29/82	63	51.0 ± 1.16	54.7 ± 1.24	+7.2
12/30/82	64	50.1 ± 1.08	50.8 ± 1.04	+1.4
1/3/83	65	50.0 ± 1.39	49.1 ± 1.37	-1.8
1/4/83	66	51.3 ± 1.57	51.7 ± 1.59	+0.8
1/6/83	68	52.7 ± 0.93	49.1 ± 0.87	-6.8
1/7/83	69	52.0 ± 1.16	53.6 ± 1.20	+3.1
1/10/83	70	50.0 ± 0.79	51.1 ± 0.79	+2.2
1/11/83	71	50.7 ± 2.09	59.6 ± 2.46	+17.5
1/12/83	72	51.7 ± 3.40	56.1 ± 3.68	+8.5
1/13/83	73	51.6 ± 2.38	54.2 ± 2.50	+5.0
1/14/83	74	50.3 ± 2.51	50.6 ± 2.51	+0.6
1/17/83	75	50.1 ± 4.33	48.5 ± 4.20	-3.2
1/18/83	76	50.0 ± 1.65	51.8 ± 1.69	+3.6
1/19/83	77	50.3 ± 0.67	51.7 ± 0.71	+2.8
1/20/83	78	50.4 ± 0.54	51.1 ± 0.54	+1.4
1/21/83	79	50.0 ± 0.96	53.5 ± 1.03	+7.0
1/24/83	80	50.3 ± 0.48	51.6 ± 0.51	+2.6
1/25/83	81	49.8 ± 1.63	48.1 ± 1.60	-3.4
1/27/83	83	49.5 ± 0.98	53.8 ± 1.07	+8.7
1/28/83	84	50.2 ± 1.65	51.9 ± 1.71	+3.4
1/31/83	85	51.2 ± 1.22	52.3 ± 1.25	+2.1
2/2/83	87	49.9 ± 0.99	49.2 ± 0.96	-1.4
2/8/83	91	50.0 ± 2.07	51.0 ± 2.10	+2.0
2/25/83	103	50.1 ± 1.06	49.2 ± 1.44	-1.8
3/2/83	106	51.0 ± 2.18	52.0 ± 2.23	+2.0
3/9/83	111	50.4 ± 0.52	49.1 ± 0.49	-2.6
3/10/83	112	51.3 ± 1.31	54.0 ± 1.37	+5.3
3/11/83	113	48.1 ± 1.03	49.2 ± 1.05	+2.3
3/16/83	116	51.8 ± 2.03	52.6 ± 2.08	+1.5
4/11/83	134	50.2 ± 1.33	51.4 ± 1.37	+2.4
4/26/83	145	50.3 ± 0.95	48.6 ± 0.93	-3.4
4/29/83	148	50.6 ± 1.06	51.5 ± 1.10	+1.8
5/2/83	149	51.4 ± 3.05	51.6 ± 3.07	+0.4
5/3/83	150	50.4 ± 2.17	49.1 ± 2.12	-2.6
5/5/83	152	57.5 ± 12.2	59.9 ± 12.7	+4.2
5/11/83	156	49.2 ± 1.61	51.6 ± 1.70	+4.9
5/13/83	158	49.5 ± 2.05	51.0 ± 2.11	+3.0
5/16/83	159	52.7 ± 4.58	52.3 ± 4.54	-0.8
6/20/83	182	51.1 ± 2.50	51.6 ± 2.54	+1.0
6/21/83	183	50.9 ± 2.22	48.6 ± 2.13	-4.5
6/22/83	184	49.3 ± 1.93	51.8 ± 2.03	+5.1
7/1/83	191	50.4 ± 1.70	52.2 ± 1.77	+3.6
7/5/83	192	47.5 ± 1.01	48.7 ± 1.04	+2.5
7/7/83	194	49.3 ± 1.79	50.2 ± 1.83	+1.8

EDC/ET (concluded)

		Daily Mean		
Date	Exposure Day	Uncorrected	Corrected	% Difference
7/12/83	197	51.4 ± 1.70	55.8 ± 1.85	+8.6
7/13/83	198	50.1 ± 1.01	50.0 ± 1.01	-0.2
7/15/83	200	48.6 ± 1.36	54.5 ± 1.53	+12.1
7/29/83	210	50.0 ± 0.44	51.4 ± 0.46	+2.8
8/1/83	211	50.0 ± 0.91	47.5 ± 0.89	-5.0
8/4/83	214	49.8 ± 1.22	53.0 ± 1.31	+6.4
8/8/83	216	50.0 ± 1.77	63.0 ± 2.20	+26.0
8/9/83	217	50.2 ± 0.76	60.2 ± 0.90	+19.9
8/10/83	218	50.9 ± 1.10	58.1 ± 1.26	+14.1
8/11/83	219	50.4 ± 1.26	58.1 ± 1.45	+15.3
8/12/83	220	50.2 ± 1.64	60.2 ± 1.96	+19.9
8/16/83	222	49.2 ± 1.54	49.9 ± 1.56	+1.4
8/17/83	223	48.6 ± 0.96	47.0 ± 0.94	+3.3
8/19/83	225	49.9 ± 1.25	53.2 ± 1.34	+6.6
8/22/83	226	48.9 ± 1.21	51.3 ± 1.32	+4.9
8/23/83	227	49.8 ± 0.75	55.9 ± 0.86	+12.2
8/24/83	228	50.4 ± 1.09	52.6 ± 1.14	+4.4
8/26/83	230	49.7 ± 1.06	47.5 ± 1.00	-4.4
8/29/83	231	50.0 ± 1.70	53.2 ± 1.80	+6.4
8/30/83	232	49.0 ± 0.67	52.5 ± 0.75	+7.1
9/1/83	234	50.7 ± 1.05	54.6 ± 1.11	+7.7
9/6/83	236	49.3 ± 1.88	48.2 ± 1.87	-2.2
9/7/83	237	50.4 ± 1.91	57.7 ± 2.19	+14.5
9/8/83	238	50.4 ± 1.36	52.6 ± 1.42	+4.4
9/13/83	241	51.2 ± 2.22	50.6 ± 2.19	-1.2
9/19/83	245	50.6 ± 1.51	56.4 ± 1.68	+11.5
9/20/83	246	49.7 ± 0.72	52.0 ± 0.75	+4.6
9/22/83	248	50.5 ± 1.04	51.7 ± 1.04	+2.4
9/26/83	250	51.6 ± 1.71	53.4 ± 1.77	+3.5
9/29/83	253	49.5 ± 2.28	50.5 ± 2.33	+2.0
10/3/83	255	50.9 ± 1.23	52.0 ± 1.25	+2.2
				+3.99 ± 6.05(s)%

INTEROFFICE COMMUNICATION

MIDWEST RESEARCH INSTITUTE

November 21, 1983

cc: J. Cholakis
E. Woodhouse
E. Murrill
D. Steele

To: Gene Podrebarac

From: Gus Kuhn

Subject: Analysis of Disulfiram Feed Sample - Project No. 7452-E

On October 26, 1983, a dosed feed sample identified as Disulfiram Feed, Lot 20 was received along with four samples of freshly prepared feed blends submitted for disulfiram analysis. All five samples were analyzed together, and results on the four fresh blends have been reported separately (see MRI Internal Analytical Report dated November 3, 1983).

Subsequent to the analysis of the samples, information was received that the feed sample labeled Lot 20 had been taken from a bulk mix which had been stored in a plastic bag in a freezer at ∿ -22°C from September 28, 1983 to October 25, 1983 (memo from G. Podrebarac to G. Kuhn dated November 18, 1983). The purpose for submitting this sample was to establish whether or not dosed feed blends remain stable under actual bioassay storage conditions. For purposes of comparison, the results below present both the original analysis data on Lot 20 and data from the current analysis.

Disulfiram Found in Feed Samples From Lot 20

Analysis Date	% Found	$\frac{\text{Found}}{\text{Label Conc.}}$ (%)
9/29/83	0.0497	
	0.0498	
	0.0498 ± 0.0001(s)	99.6 ± 0.1(s)
10/27/83	0.0490	
	0.0487	
	0.0488 ± 0.0002(s)	97.6 ± 0.2(s)

These results indicate that dosed feed blends stored approximately 1 month under conditions used by the bioassayer retain > 97% of their original disulfiram dose concentration.

GK/gls

INTERNAL ANALYTICAL REPORT
April 13, 1983
Project No. 7452-B

Validation of the Autosampling System

I. Purpose

To validate the autosampling system being used in the chronic inhalation study.

II. Method

This analysis was conducted by comparison of injections of 1-cc aliquots of EDC chamber atmosphere using the automatic sampling system with manual 1-cc injections removed from the same atmosphere using a gas-tight syringe.

III. Analysis

1. Sampling procedure: Using a 1-cc gas-tight syringe, triplicate grab samples of EDC chamber atmosphere were removed from an equilibrated inhalation chamber and analyzed for EDC concentration. Similarly, triplicate samples of EDC chamber atmosphere were obtained from the same inhalation chamber using the automatic sampling system and analyzed in the same manner.

2. Gas chromatographic system: This system is the system used for daily concentration monitoring.

Instrument: Varian 2400 gas chromatograph
Detector: Flame ionization
Column: 10% Carbowax 20M-TPA on 80/100 Chromasorb W(AW);
1.8 m x 2 mm ID; nickel
Carrier Gas: Nitrogen
Carrier Gas Flow Rate: 30 cc/min
Inlet Temperature: 150°C
Detector Temperature: 250°C
Column Oven Temperature: 70°C
Data Handling: Varian CDS 111 integrator

3. Results: The concentrations of EDC (in ppm) obtained from this experiment are presented below:

Autosampler (uncorrected)	Autosampler (corrected to 25°C)[a]	Manual (at 25°C)
45.8	52.7	53.6
45.4	52.2	54.0
44.3	51.0	52.3
Avg = 45.2 ± 0.8(s) ppm	Avg = 52.0 ± 0.9(s) ppm	Avg = 53.3 ± 0.9(s) ppm

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a Uncorrected autosampler injections were corrected to 25°C by dividing the concentration of EDC by

$$\left(\frac{298°K}{343°K}\right)$$

This temperature correction is taken because the autosampler samples the atmosphere at 70°C (343°K) while the manual samples were taken at 25°C (298°K).

The autosampler injections were found to be 97.6 ± 2.4(s)% of the manual injections.

IV. Conclusion

The results obtained using the autosampling system were found to be 97.6 ± 2.4(s)% of those obtained from manual injections of chamber atmosphere. These results validate the use of the autosampling system for this study.

Approved:

Evelyn Murrill

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Section

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Allan Chatham

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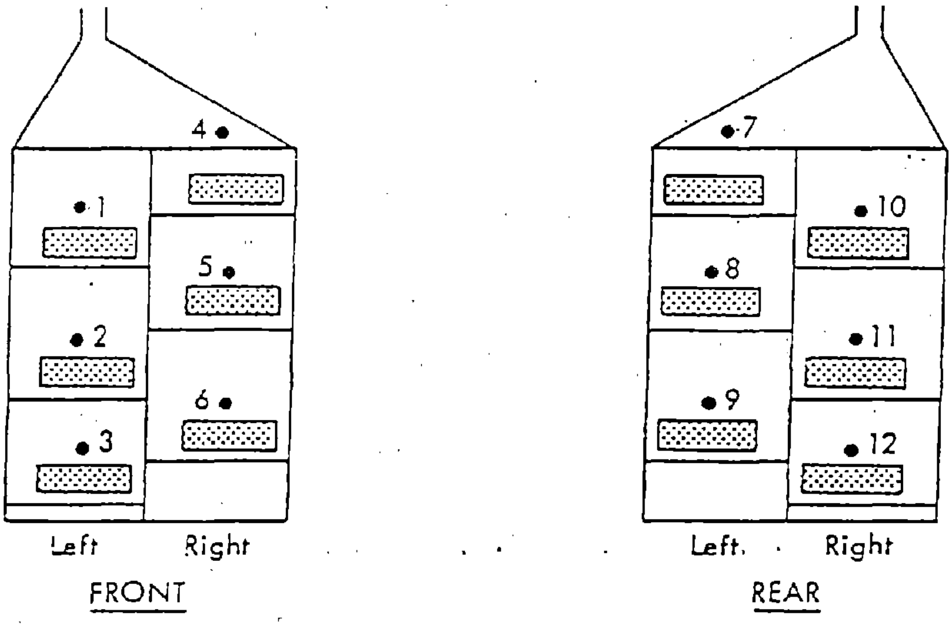
Associate Chemist

CHAMBER DISTRIBUTION STUDY FORM

Chamber K4 - EDC/DS Group



Port No.		
1	Left Upper:	55.7
2	Left Middle:	49.7
3	Left Lower:	48.9
4	Right Upper:	53.7
5	Right Middle:	49.8
6	Right Lower:	49.7

Port No.		
7	Left Upper:	56.2
8	Left Middle:	53.5
9	Left Lower:	49.9
10	Right Upper:	50.1
11	Right Middle:	48.6
12	Right Lower:	48.1

Chemical: EDC
Chamber Target
Concentration: 50 ppm
Date: 9/4/82
Observer: J. M. Cholakis

Temp: 69°F
Humidity: 65%

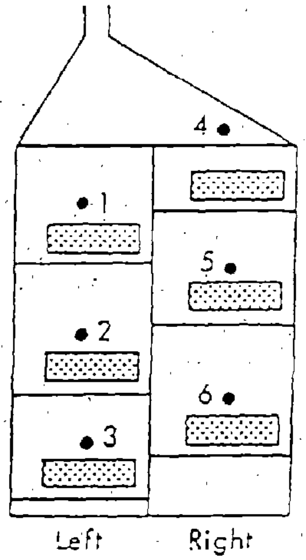
$$C.V. = \frac{S.D.}{\overline{X}} \times 100$$

$$C.V. = \frac{2.83}{51.16} \times 100 = 5.5\%$$

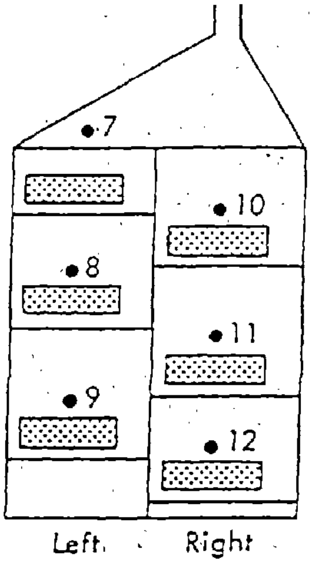
28-30 lpm dilution air
turbulator in-line
flowmeter (#602) for EDC = 50 units = 200 cc/min
orifice reading: 0.05 in. H_2O (11 air changes/hr)

CHAMBER DISTRIBUTION STUDY FORM

Chamber K5 - EDC Group



FRONT



REAR

Port
No.
1 Left Upper: 48.8
2 Left Middle: 46.0
3 Left Lower: 46.9
4 Right Upper : 52.5
5 Right Middle: 48.0
6 Right Lower: 47.3

Port
No.
7 Left Upper : 52.1
8 Left Middle: 48.3
9 Left Lower: 47.2
10 Right Upper: 51.4
11 Right Middle: 47.6
12 Right Lower: 46.4

Chemical: EDC
Chamber Target
Concentration: 50 ppm
Date: 9/4/82
Observer: J. M. Cholakis

Temp: 70°F
Humidity: 65%

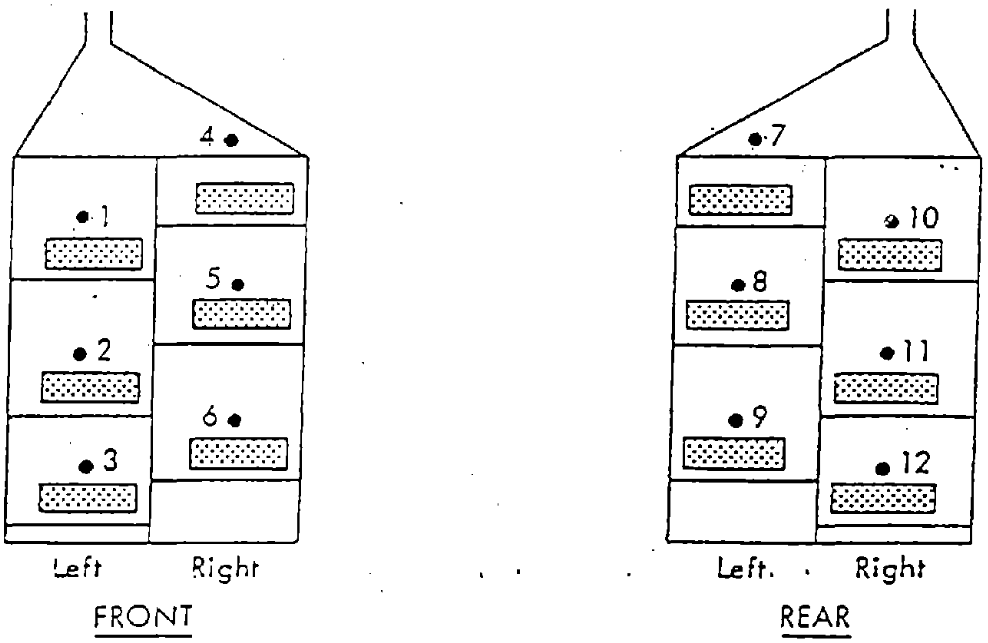
$$C.V. = \frac{S.D.}{\bar{X}} \times 100$$

$$C.V. = \frac{2.23}{48.5} \times 100 = 4.6\%$$

28-30 lpm dilution air
Turbulator in-line
EDC flowmeter (#602) = 50 units = 200 cc/min
Orifice reading: 0.05 in. H_2O (11 air changes/hr)

CHAMBER DISTRIBUTION STUDY FORM

Chamber K6 - EDC/ET Group



Port
No.

1 Left Upper: 58.9
2 Left Middle: 55.7
3 Left Lower: 52.7
4 Right Upper : 58.0
5 Right Middle: 53.3
6 Right Lower: 52.8

Port
No.

7 Left Upper : 57.2
8 Left Middle: 52.6
9 Left Lower: 51.2
10 Right Upper: 56.2
11 Right Middle: 52.0
12 Right Lower: 51.7

Chemical: EDC
Chamber Target
Concentration: 50 ppm
Date: 9/5/82
Observer: J. M. Cholakis

Temp: 70°F
Humidity: 62%

$$C.V. = \frac{S.D.}{\overline{X}} \times 100$$

$$C.V. = \frac{2.68}{54.4} \times 100 = 4.9\%$$

28-30 lpm dilution air
Turbulator in-line
EDC flowmeter = 200 cc/min
Orifice reading: 0.05 in. H_2O

APPENDIX 5

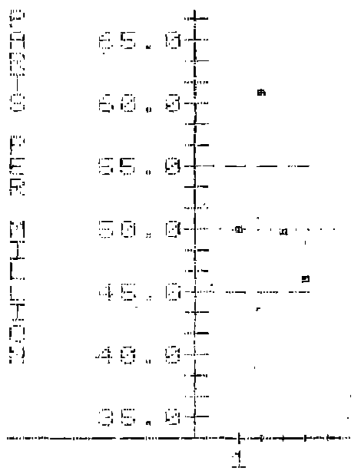
DAILY EDC CHAMBER CONCENTRATIONS

- EDC Chamber
- EDC/DS Chamber
- EDC/ET Chamber

EDC CHAMBER CONCENTRATIONS (K5)

CHAMBER CONCENTRATIONS EDC
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 1 THRU 1

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
09/27/82	1	1	50.0 +/- 3.13(8)	45.8	56.3
09/28/82	1	2	60.8 +/- 8.98(13)	46.2	71.8
09/29/82	1	3	49.9 +/- 1.44(14)	46.4	53.2
09/30/82	1	4	46.2 +/- 4.43(16)	34.8	49.9
WEEK SUMMARY			AV = 51.7 n = 4	34.8	71.8
REPORT SUMMARY			AV = 51.7 n = 4	34.8	71.8



EXPOSURE WEEK

H - HOLIDAY N - OTHER O - OFF SCALE

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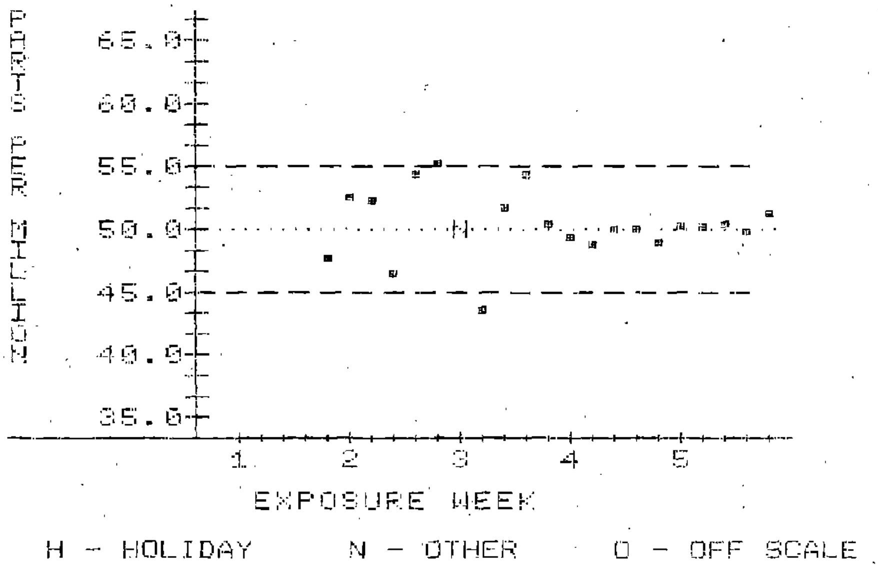
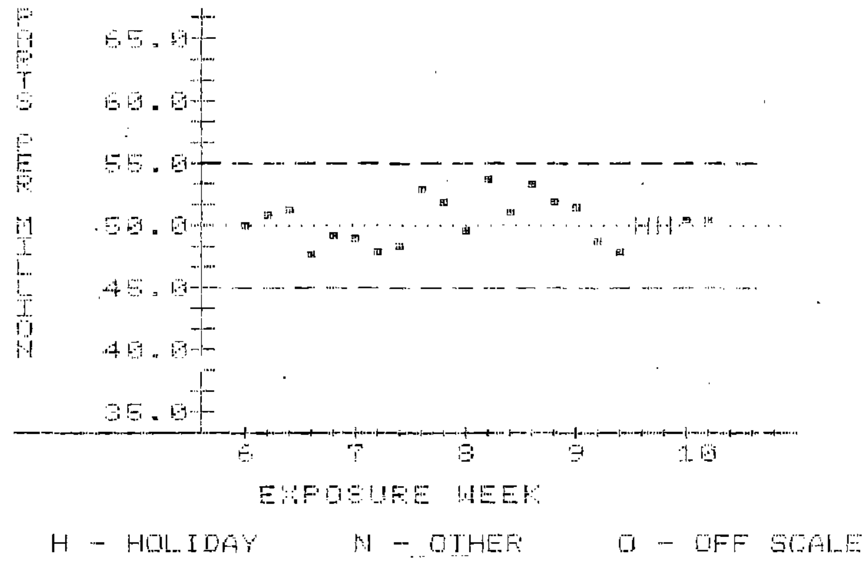
CHAMBER CONCENTRATIONS EDC
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 1 THRU 5

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
10/01/82	1	5	47.7 +/- 1.89(15)	44.4	50.3
WEEK SUMMARY			AV = 47.7 n = 1	44.4	50.3
10/04/82	2	6	52.6 +/- .57(10)	51.7	53.4
10/05/82	2	7	52.3 +/- 2.43(8)	46.7	54.2
10/06/82	2	8	46.6 +/- 6.98(13)	30.2	57.7
10/07/82	2	9	54.4 +/- 3.39(11)	50.6	59.6
10/08/82	2	10	55.3 +/- 7.80(12)	50.9	72.4
WEEK SUMMARY			AV = 52.2 n = 5	30.2	72.4
10/11/82	3		NON-EXPOSURE		
10/12/82	3	11	43.6 +/- 7.87(13)	34.3	56.5
10/13/82	3	12	51.6 +/- 7.58(13)	41.7	74.0
10/14/82	3	13	54.4 +/- 9.29(13)	27.1	69.0
10/15/82	3	14	50.4 +/- 5.88(17)	44.0	62.6
WEEK SUMMARY			AV = 50.0 n = 4	27.1	74.0
10/18/82	4	15	49.5 +/- .47(11)	48.6	50.5
10/19/82	4	16	48.7 +/- 3.24(15)	41.8	53.4
10/20/82	4	17	50.1 +/- 3.83(12)	43.2	54.7
10/21/82	4	18	50.1 +/- 3.36(17)	40.6	54.3
10/22/82	4	19	49.1 +/- 1.81(16)	43.7	52.2
WEEK SUMMARY			AV = 49.5 n = 5	40.6	54.7
10/25/82	5	20	50.2 +/- 2.11(17)	46.3	52.7
10/26/82	5	21	50.3 +/- 3.98(15)	43.5	56.0
10/27/82	5	22	50.4 +/- 1.43(11)	47.7	52.3
10/28/82	5	23	49.9 +/- 1.88(16)	47.3	54.5
10/29/82	5	24	51.2 +/- 3.59(16)	46.0	57.0
WEEK SUMMARY			AV = 50.4 n = 5	43.5	57.0
REPORT SUMMARY			AV = 50.4 n = 20	27.1	74.0



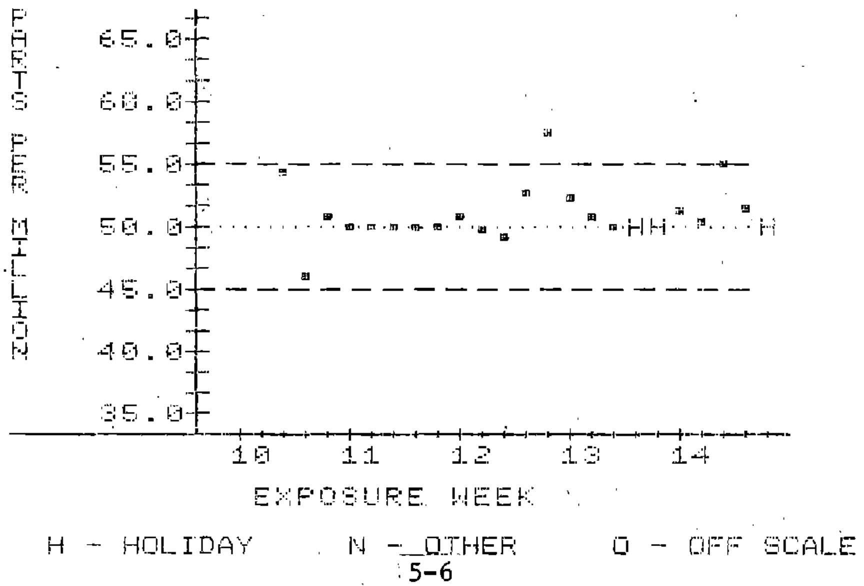
CHAMBER CONCENTRATIONS EDC
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 6 THRU 10

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
11/01/82	6	25	50.0 +/- 2.00(15)	43.2	51.9
11/02/82	6	26	50.9 +/- 3.55(5)	47.0	55.2
11/03/82	6	27	51.2 +/- 2.45(4)	48.7	54.5
11/04/82	6	28	47.7 +/- 2.98(6)	43.2	51.1
11/05/82	6	29	49.3 +/- 2.63(7)	44.4	52.8
WEEK SUMMARY			AV = 49.8 n = 5	43.2	55.2
11/08/82	7	30	49.1 +/- 2.49(7)	46.3	53.8
11/09/82	7	31	48.0 +/- 2.63(6)	45.1	51.9
11/10/82	7	32	48.3 +/- 1.19(7)	45.8	49.1
11/11/82	7	33	53.0 +/- 1.84(7)	50.8	55.2
11/12/82	7	34	52.0 +/- 3.25(7)	47.6	56.2
WEEK SUMMARY			AV = 50.1 n = 5	45.1	56.2
11/15/82	8	35	49.6 +/- 8.01(8)	40.8	63.2
11/16/82	8	36	53.7 +/- 5.61(8)	45.7	60.6
11/17/82	8	37	51.1 +/- .83(9)	49.8	52.0
11/18/82	8	38	53.4 +/- 2.92(6)	51.3	59.2
11/19/82	8	39	51.8 +/- 4.50(7)	48.3	61.5
WEEK SUMMARY			AV = 51.9 n = 5	40.8	63.2
11/22/82	9	40	51.5 +/- 4.28(14)	41.4	57.9
11/23/82	9	41	48.7 +/- 5.13(14)	41.4	56.8
11/24/82	9	42	47.9 +/- 4.27(11)	42.5	55.6
11/25/82	9		HOLIDAY		
11/26/82	9		HOLIDAY		
WEEK SUMMARY			AV = 49.4 n = 3	41.4	57.9
11/29/82	10	43	50.4 +/- 1.94(7)	47.6	52.4
11/30/82	10	44	50.4 +/- 3.61(6)	45.0	54.5
WEEK SUMMARY			AV = 50.4 n = 2	45.0	54.5
REPORT SUMMARY			AV = 50.4 n = 20	40.8	63.2



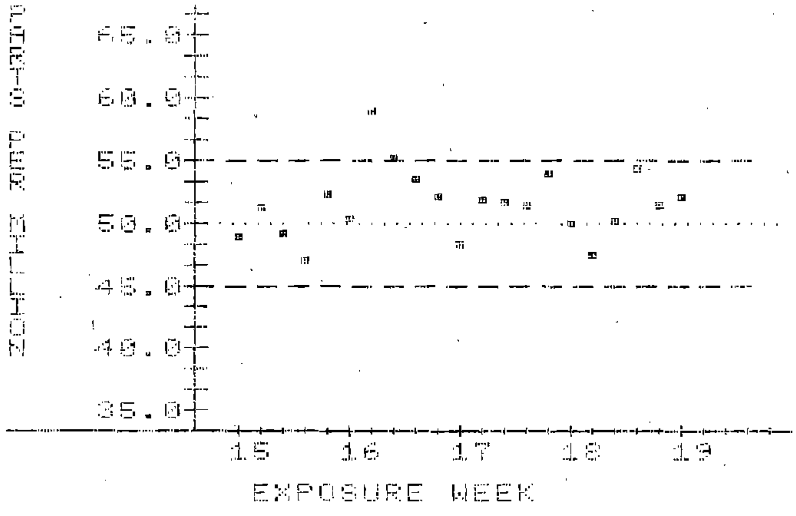
CHAMBER CONCENTRATIONS EDC
7452B: ETHYLENE DICHLORIDE 50 PPM
WEEK 10 THRU 14

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)			MINIMUM READING	MAXIMUM READING
12/01/82	10	45	54.4	+/-	2.79(6)	51.0	58.3
12/02/82	10	46	46.1	+/-	4.05(7)	37.6	49.7
12/03/82	10	47	50.8	+/-	1.33(9)	48.7	52.7
WEEK SUMMARY			AV = 50.4		n = 3	37.6	58.3
12/06/82	11	48	50.0	+/-	.00(8)	50.0	50.0
12/07/82	11	49	50.0	+/-	.00(8)	50.0	50.0
12/08/82	11	50	50.0	+/-	.00(8)	50.0	50.0
12/09/82	11	51	50.0	+/-	.00(9)	50.0	50.0
12/10/82	11	52	50.0	+/-	.00(8)	50.0	50.0
WEEK SUMMARY			AV = 50.0		n = 5	50.0	50.0
12/13/82	12	53	50.8	+/-	1.33(9)	48.7	52.7
12/14/82	12	54	49.9	+/-	2.74(7)	45.7	54.3
12/15/82	12	55	49.2	+/-	3.59(7)	43.2	53.5
12/16/82	12	56	52.8	+/-	2.05(6)	49.0	54.6
12/17/82	12	57	57.4	+/-	.78(5)	56.5	58.6
WEEK SUMMARY			AV = 52.0		n = 5	43.2	58.6
12/20/82	13	58	52.3	+/-	6.30(7)	46.0	64.9
12/21/82	13	59	50.8	+/-	1.73(14)	48.8	55.1
12/22/82	13	60	50.0	+/-	2.02(9)	46.4	51.9
12/23/82	13		HOLIDAY				
12/24/82	13		HOLIDAY				
WEEK SUMMARY			AV = 51.0		n = 3	46.0	64.9
12/27/82	14	61	51.3	+/-	.76(9)	50.4	52.6
12/28/82	14	62	50.5	+/-	1.59(11)	47.2	52.6
12/29/82	14	63	55.1	+/-	.93(13)	53.7	56.5
12/30/82	14	64	51.4	+/-	1.17(14)	48.0	52.5
12/31/82	14		HOLIDAY				
WEEK SUMMARY			AV = 52.1		n = 4	47.2	56.5
REPORT SUMMARY			AV = 51.1		n = 20	37.6	64.9



CHAMBER CONCENTRATIONS EDC
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 15 THRU 19

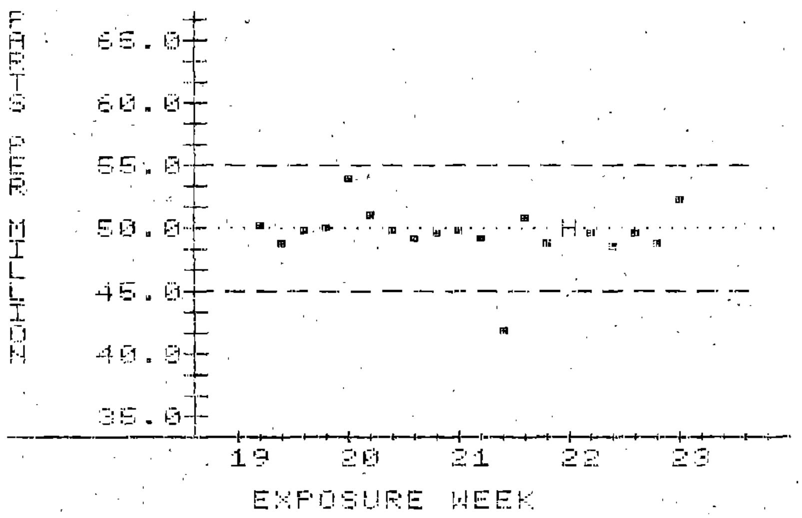
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)			MINIMUM READING	MAXIMUM READING
01/03/83	15	65	49.1	+/-	1.06(11)	47.6	51.4
01/04/83	15	66	51.2	+/-	1.11(13)	50.2	53.8
01/05/83	15	67	49.2	+/-	1.21(13)	45.7	51.1
01/06/83	15	68	47.2	+/-	1.11(14)	45.7	48.6
01/07/83	15	69	52.4	+/-	1.06(13)	50.0	53.8
WEEK SUMMARY			AV = 49.8		n = 5	45.7	53.8
01/10/83	16	70	50.4	+/-	1.84(12)	47.8	53.4
01/11/83	16	71	58.9	+/-	1.04(13)	57.9	60.9
01/12/83	16	72	55.3	+/-	1.97(13)	52.3	58.7
01/13/83	16	73	53.5	+/-	3.13(14)	47.7	59.4
01/14/83	16	74	52.2	+/-	4.19(13)	47.6	61.1
WEEK SUMMARY			AV = 54.1		n = 5	47.6	61.1
01/17/83	17	75	48.4	+/-	2.39(8)	45.2	51.1
01/18/83	17	76	51.8	+/-	.85(11)	50.7	54.0
01/19/83	17	77	51.6	+/-	.75(13)	50.1	53.0
01/20/83	17	78	51.4	+/-	1.14(13)	49.6	54.4
01/21/83	17	79	53.9	+/-	2.09(13)	52.1	60.3
WEEK SUMMARY			AV = 51.4		n = 5	45.2	60.3
01/24/83	18	80	50.1	+/-	2.24(12)	47.2	53.5
01/25/83	18	81	47.6	+/-	.68(13)	45.7	48.7
01/26/83	18	82	50.3	+/-	1.02(13)	48.8	52.8
01/27/83	18	83	54.3	+/-	.77(13)	52.0	55.2
01/28/83	18	84	51.5	+/-	1.59(13)	50.0	56.4
WEEK SUMMARY			AV = 50.8		n = 5	45.7	56.4
01/31/83	19	85	52.1	+/-	1.30(11)	51.2	55.9
WEEK SUMMARY			AV = 52.1		n = 1	51.2	55.9
REPORT SUMMARY			AV = 51.5		n = 21	45.2	61.1



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS EDC
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 19 THRU 23

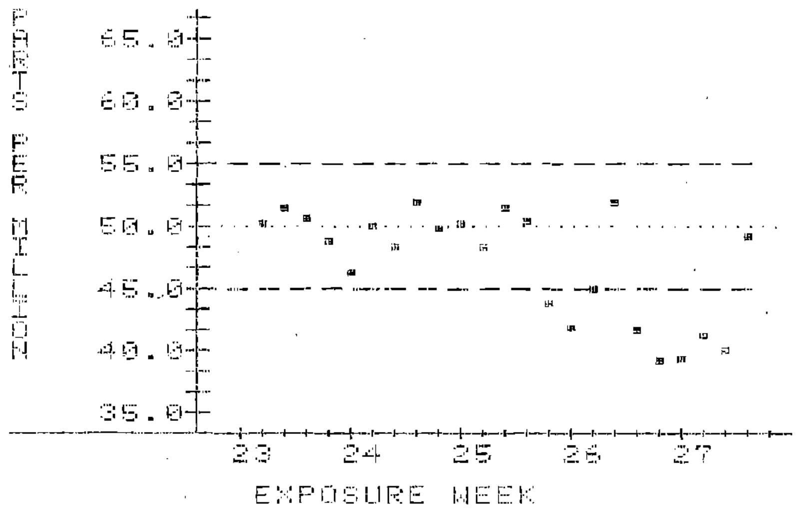
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n).	MINIMUM READING	MAXIMUM READING
02/01/83	19	86	50.2 +/- 3.83(9)	45.3	57.1
02/02/83	19	87	48.7 +/- .99(14)	47.3	50.7
02/03/83	19	88	49.8 +/- 2.36(13)	45.2	52.4
02/04/83	19	89	50.0 +/- .58(14)	49.4	51.3
WEEK SUMMARY			AV = 49.7 n = 4	45.2	57.1
02/07/83	20	90	54.0 +/- .12(3)	53.9	54.1
02/08/83	20	91	51.1 +/- 3.08(11)	47.0	55.8
02/09/83	20	92	49.9 +/- 1.57(13)	46.4	51.3
02/10/83	20	93	49.3 +/- 1.17(14)	46.6	51.7
02/11/83	20	94	49.7 +/- 2.29(13)	44.2	52.1
WEEK SUMMARY			AV = 50.8 n = 5	44.2	55.8
02/14/83	21	95	49.9 +/- 1.13(13)	49.1	53.4
02/15/83	21	96	49.2 +/- 1.28(14)	47.5	52.6
02/16/83	21	97	42.0 +/- 1.04(11)	40.8	44.5
02/17/83	21	98	50.8 +/- 2.72(12)	45.8	54.7
02/18/83	21	99	48.8 +/- 3.36(14)	44.8	53.6
WEEK SUMMARY			AV = 48.1 n = 5	40.8	54.7
02/21/83	22		HOLIDAY		
02/22/83	22	100	49.6 +/- 2.27(13)	45.2	52.2
02/23/83	22	101	48.6 +/- 1.82(13)	46.2	51.7
02/24/83	22	102	49.7 +/- 2.77(12)	46.9	55.2
02/25/83	22	103	48.7 +/- .80(14)	47.4	50.2
WEEK SUMMARY			AV = 49.2 n = 4	45.2	55.2
02/28/83	23	104	52.3 +/- 2.34(12)	48.2	56.1
WEEK SUMMARY			AV = 52.3 n = 1	48.2	56.1
REPORT SUMMARY			AV = 49.6 n = 19	40.8	57.1



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS EDC
7452B: ETHYLENE DICHLORIDE 50 PPM
WEEK 23 THRU 27

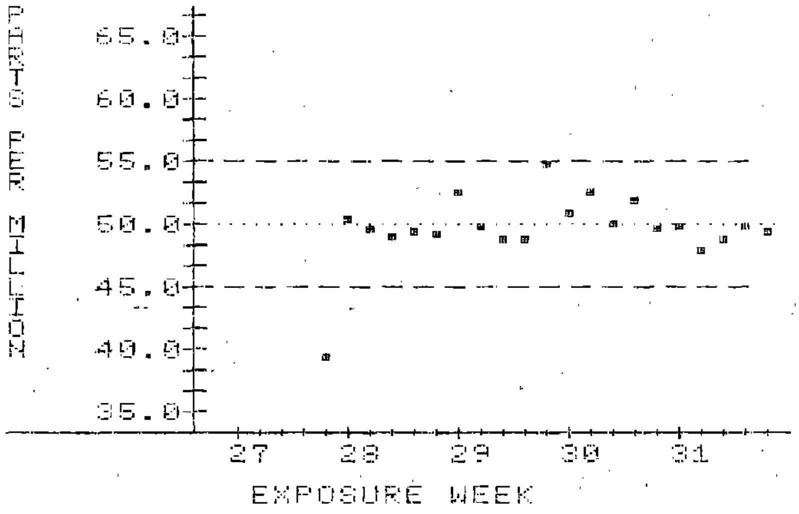
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)			MINIMUM READING	MAXIMUM READING
03/01/83	23	105	50.2	+/-	2.01(11)	46.6	53.7
03/02/83	23	106	51.5	+/-	1.29(12)	49.5	53.6
03/03/83	23	107	50.6	+/-	1.91(13)	47.8	54.9
03/04/83	23	108	48.9	+/-	1.35(12)	46.3	50.6
WEEK SUMMARY			AV = 50.3		n = 4	46.6	54.9
03/07/83	24	109	46.3	+/-	2.74(10)	40.8	48.2
03/08/83	24	110	50.1	+/-	3.18(12)	42.2	54.8
03/09/83	24	111	48.3	+/-	1.90(13)	45.4	53.0
03/10/83	24	112	52.0	+/-	1.31(11)	50.3	55.2
03/11/83	24	113	49.9	+/-	1.08(11)	47.5	51.4
WEEK SUMMARY			AV = 49.3		n = 5	40.8	55.2
03/14/83	25	114	50.3	+/-	1.19(12)	47.7	51.7
03/15/83	25	115	48.3	+/-	1.57(13)	45.9	50.7
03/16/83	25	116	51.4	+/-	2.87(11)	47.1	58.2
03/17/83	25	117	50.5	+/-	1.93(13)	47.4	54.9
03/18/83	25	118	43.8	+/-	1.70(12)	40.5	46.1
WEEK SUMMARY			AV = 48.9		n = 5	40.5	58.2
03/21/83	26	119	42.0	+/-	2.44(11)	38.4	46.6
03/22/83	26	120	45.0	+/-	8.84(8)	32.8	57.9
03/23/83	26	121	51.9	+/-	3.22(12)	45.3	55.2
03/24/83	26	122	41.8	+/-	3.44(13)	38.7	51.5
03/25/83	26	123	39.3	+/-	2.74(12)	34.7	44.8
WEEK SUMMARY			AV = 44.0		n = 5	32.8	57.9
03/28/83	27	124	39.5	+/-	1.84(12)	37.5	43.1
03/29/83	27	125	41.4	+/-	2.89(12)	36.5	46.4
03/30/83	27	126	40.2	+/-	2.30(12)	35.8	45.1
03/31/83	27	127	49.3	+/-	1.35(12)	47.1	51.4
WEEK SUMMARY			AV = 42.6		n = 4	35.8	51.4
REPORT SUMMARY			AV = 47.1		n = 23	32.8	58.2



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS EDC
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 27 THRU 31

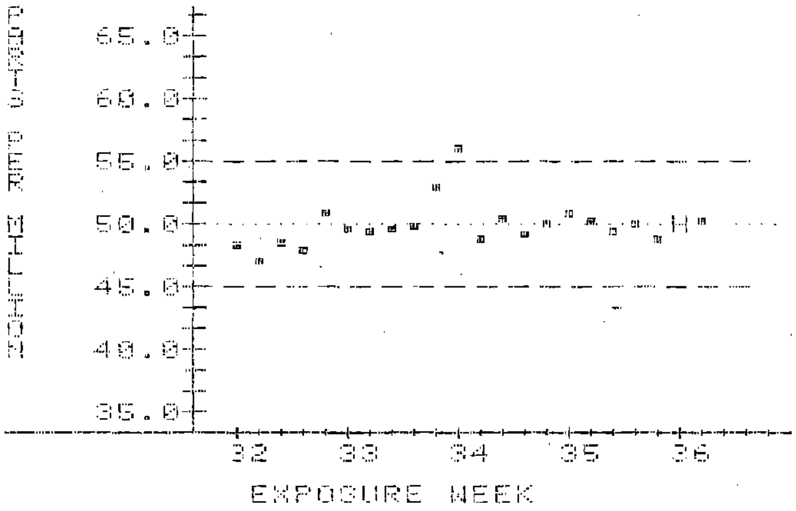
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN	+/-	S.D. (n)	MINIMUM READING	MAXIMUM READING
04/01/83	27	128	39.5	+/-	3.97(5)	36.0	45.5
WEEK SUMMARY			AV = 39.5		n = 1	36.0	45.5
04/04/83	28	129	50.5	+/-	2.10(11)	48.2	56.2
04/05/83	28	130	49.6	+/-	1.75(12)	48.3	54.8
04/06/83	28	131	49.0	+/-	1.79(12)	46.7	52.0
04/07/83	28	132	49.5	+/-	1.03(12)	47.6	51.7
04/08/83	28	133	49.2	+/-	1.30(12)	47.7	52.2
WEEK SUMMARY			AV = 49.6		n = 5	46.7	56.2
04/11/83	29	134	52.5	+/-	1.05(8)	51.2	54.8
04/12/83	29	135	49.8	+/-	.72(12)	48.6	50.9
04/13/83	29	136	48.8	+/-	1.39(12)	47.6	52.9
04/14/83	29	137	48.9	+/-	1.68(11)	45.5	50.7
04/15/83	29	138	54.7	+/-	2.51(12)	52.0	60.8
WEEK SUMMARY			AV = 50.9		n = 5	45.5	60.8
04/18/83	30	139	50.9	+/-	2.18(13)	48.6	56.8
04/19/83	30	140	52.5	+/-	2.21(11)	49.8	57.6
04/20/83	30	141	50.1	+/-	1.31(12)	48.2	52.5
04/21/83	30	142	51.9	+/-	1.68(11)	50.1	56.6
04/22/83	30	143	49.6	+/-	3.22(12)	47.0	59.5
WEEK SUMMARY			AV = 51.0		n = 5	47.0	59.5
04/25/83	31	144	49.8	+/-	3.07(10)	44.9	54.6
04/26/83	31	145	48.0	+/-	2.14(11)	44.7	51.5
04/27/83	31	146	48.9	+/-	1.49(12)	45.7	50.6
04/28/83	31	147	49.9	+/-	2.62(12)	46.1	53.5
04/29/83	31	148	49.4	+/-	3.03(10)	44.2	54.3
WEEK SUMMARY			AV = 49.2		n = 5	44.2	54.6
REPORT SUMMARY			AV = 49.7		n = 21	36.0	60.8



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS EOC
7452B: ETHYLENE DICHLORIDE 50 PPM
WEEK 32 THRU 36

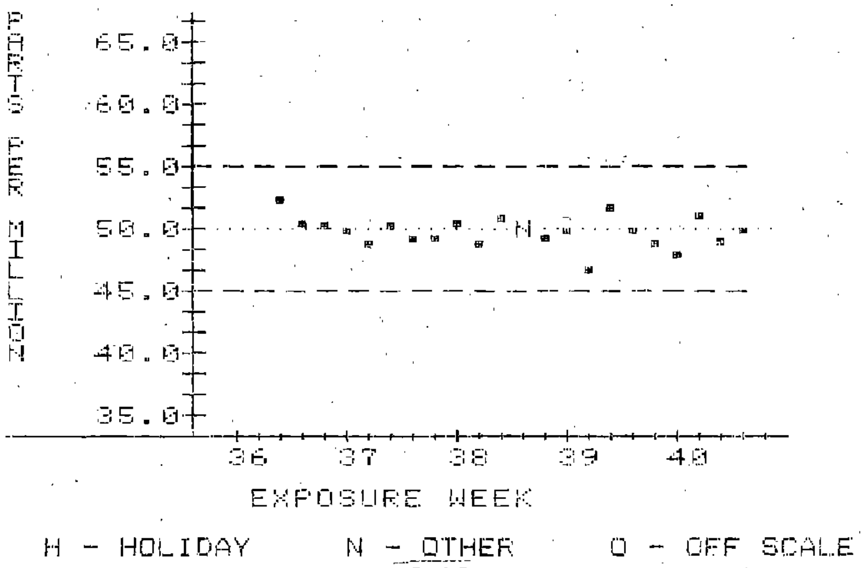
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
05/02/83	32	149	48.4 +/- 2.84(12)	44.0	54.3
05/03/83	32	150	47.2 +/- 2.03(13)	43.2	50.4
05/04/83	32	151	48.5 +/- 1.95(12)	45.5	52.6
05/05/83	32	152	47.9 +/- 14.52(8)	31.3	76.8
05/06/83	32	153	50.8 +/- 2.85(13)	48.1	59.4
WEEK SUMMARY			AV = 48.6 n = 5	31.3	76.8
05/09/83	33	154	49.7 +/- 2.51(12)	45.3	53.1
05/10/83	33	155	49.4 +/- 2.15(12)	45.7	53.7
05/11/83	33	156	49.7 +/- 5.21(12)	39.7	59.1
05/12/83	33	157	49.9 +/- 2.52(12)	45.4	53.9
05/13/83	33	158	52.9 +/- 3.18(13)	46.0	58.2
WEEK SUMMARY			AV = 50.3 n = 5	39.7	59.1
05/16/83	34	159	56.0 +/- 7.28(10)	45.8	67.1
05/17/83	34	160	48.6 +/- 2.93(12)	41.9	52.5
05/18/83	34	161	50.4 +/- 2.72(12)	46.0	54.0
05/19/83	34	162	49.3 +/- 2.36(12)	47.1	56.0
05/20/83	34	163	50.1 +/- 3.51(11)	47.1	59.2
WEEK SUMMARY			AV = 50.9 n = 5	41.9	67.1
05/23/83	35	164	50.9 +/- 2.84(12)	46.2	55.3
05/24/83	35	165	50.3 +/- 2.64(11)	46.5	54.3
05/25/83	35	166	49.4 +/- 1.91(12)	46.8	53.3
05/26/83	35	167	50.1 +/- 3.23(12)	43.4	55.4
05/27/83	35	168	48.8 +/- 2.74(13)	44.6	54.0
WEEK SUMMARY			AV = 49.9 n = 5	43.4	55.4
05/30/83	36		HOLIDAY		
05/31/83	36	169	50.3 +/- 6.47(13)	39.3	62.8
WEEK SUMMARY			AV = 50.3 n = 1	39.3	62.8
REPORT SUMMARY			AV = 49.9 n = 21	31.3	76.8



H - HOLIDAY N - OTHER O - OFF SCALE

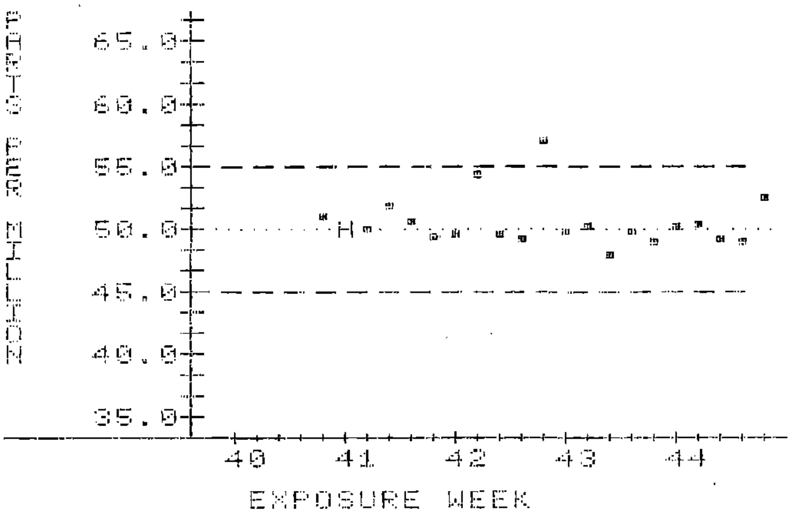
CHAMBER CONCENTRATIONS EDC
7452B: ETHYLENE DICHLORIDE 50 PPM
WEEK 36 THRU 40

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
06/01/83	36	170	52.3 +/- 4.64(12)	45.2	60.0
06/02/83	36	171	50.5 +/- 2.11(11)	47.9	56.0
06/03/83	36	172	50.2 +/- 1.99(12)	46.7	53.4
WEEK SUMMARY			AV = 51.0 n = 3	45.2	60.0
06/06/83	37	173	49.8 +/- 2.33(12)	47.4	56.0
06/07/83	37	174	48.9 +/- 1.34(10)	46.5	50.2
06/08/83	37	175	50.2 +/- 2.72(11)	45.0	53.8
06/09/83	37	176	49.2 +/- 4.69(13)	44.5	58.6
06/10/83	37	177	49.2 +/- 2.97(13)	43.6	53.9
WEEK SUMMARY			AV = 49.5 n = 5	43.6	58.6
06/13/83	38	178	50.4 +/- 1.67(13)	47.7	52.4
06/14/83	38	179	48.8 +/- 2.54(13)	45.9	55.5
06/15/83	38	180	50.8 +/- 3.21(12)	46.6	56.1
06/16/83	38		NON-EXPOSURE		
06/17/83	38	181	49.3 +/- 3.89(12)	44.1	56.7
WEEK SUMMARY			AV = 49.8 n = 4	44.1	56.7
06/20/83	39	182	49.8 +/- 3.13(12)	44.6	53.5
06/21/83	39	183	46.7 +/- 1.66(13)	43.1	49.0
06/22/83	39	184	51.6 +/- 2.35(13)	48.2	56.4
06/23/83	39	185	49.9 +/- 3.06(13)	43.2	53.8
06/24/83	39	186	48.9 +/- 3.64(13)	43.3	55.9
WEEK SUMMARY			AV = 49.4 n = 5	43.1	56.4
06/27/83	40	187	48.0 +/- 1.47(12)	45.3	50.3
06/28/83	40	188	51.0 +/- 1.46(12)	49.2	53.5
06/29/83	40	189	49.1 +/- 2.97(12)	45.4	56.1
06/30/83	40	190	49.8 +/- 2.81(13)	43.6	54.9
WEEK SUMMARY			AV = 49.5 n = 4	43.6	56.1
REPORT SUMMARY			AV = 49.7 n = 21	43.1	60.0



CHAMBER CONCENTRATIONS EDC
7452B: ETHYLENE DICHLORIDE 50 PPM
WEEK 40 THRU 44

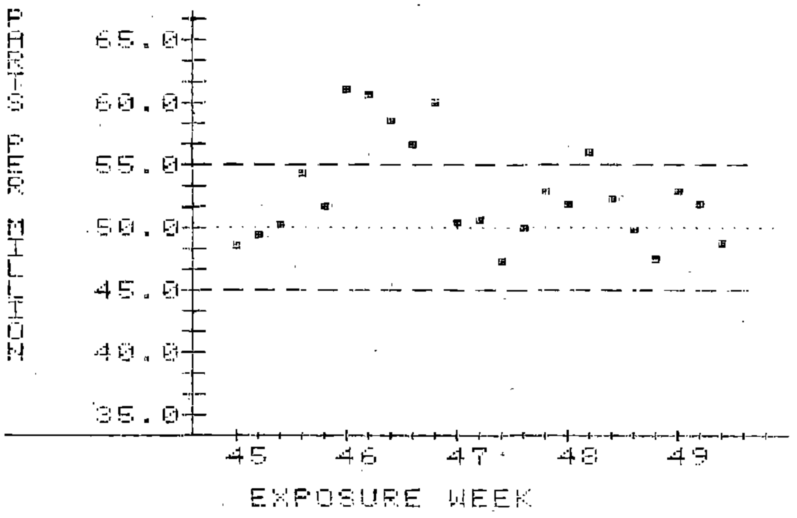
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
07/01/83	40	191	51.0 +/- 3.05(12)	47.3	56.4
WEEK SUMMARY			AV = 51.0 n = 1	47.3	56.4
07/04/83	41		HOLIDAY		
07/05/83	41	192	50.0 +/- 1.36(10)	48.4	52.9
07/06/83	41	193	51.8 +/- 1.43(12)	49.0	54.8
07/07/83	41	194	50.7 +/- 2.06(13)	48.0	54.8
07/08/83	41	195	49.5 +/- 1.08(12)	48.4	51.4
WEEK SUMMARY			AV = 50.5 n = 4	48.0	54.8
07/11/83	42	196	49.6 +/- 2.10(14)	46.1	52.2
07/12/83	42	197	54.4 +/- 1.78(14)	52.2	57.9
07/13/83	42	198	49.7 +/- 1.92(13)	47.0	53.8
07/14/83	42	199	49.2 +/- 1.51(14)	46.7	51.4
07/15/83	42	200	57.0 +/- 1.58(14)	54.5	59.3
WEEK SUMMARY			AV = 52.0 n = 5	46.1	59.3
07/18/83	43	201	49.8 +/- 2.22(12)	45.7	52.5
07/19/83	43	202	50.3 +/- 1.37(13)	47.6	52.8
07/20/83	43	203	47.9 +/- 1.56(14)	44.1	49.9
07/21/83	43	204	49.9 +/- 1.41(13)	47.0	51.7
07/22/83	43	205	49.0 +/- 2.37(13)	45.2	53.1
WEEK SUMMARY			AV = 49.4 n = 5	44.1	53.1
07/25/83	44	206	50.3 +/- 1.58(14)	47.5	52.5
07/26/83	44	207	50.5 +/- 1.83(13)	48.5	55.3
07/27/83	44	208	49.2 +/- 2.26(14)	45.3	55.0
07/28/83	44	209	49.1 +/- 1.20(14)	47.5	51.6
07/29/83	44	210	52.5 +/- 1.43(14)	49.9	55.3
WEEK SUMMARY			AV = 50.3 n = 5	45.3	55.3
REPORT SUMMARY			AV = 50.6 n = 20	44.1	59.3



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS EDC
7452B: ETHYLENE DICHLORIDE 50 PPM
WEEK 45 THRU 49

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)			MINIMUM READING	MAXIMUM READING
08/01/83	45	211	48.6	+/-	1.78(12)	44.8	51.1
08/02/83	45	212	49.5	+/-	1.59(14)	46.1	52.0
08/03/83	45	213	50.3	+/-	1.56(14)	47.8	52.4
08/04/83	45	214	54.3	+/-	1.35(14)	52.6	57.9
08/05/83	45	215	51.6	+/-	1.57(11)	49.7	55.5
WEEK SUMMARY			AV = 50.9		n = 5	44.8	57.9
08/08/83	46	216	61.0	+/-	.71(14)	59.8	62.2
08/09/83	46	217	60.6	+/-	1.06(12)	57.8	62.0
08/10/83	46	218	58.6	+/-	1.50(13)	55.9	62.2
08/11/83	46	219	56.7	+/-	2.48(14)	52.2	60.0
08/12/83	46	220	60.0	+/-	1.96(13)	56.4	62.2
WEEK SUMMARY			AV = 59.4		n = 5	52.2	62.2
08/15/83	47	221	50.4	+/-	1.93(14)	47.6	54.6
08/16/83	47	222	50.7	+/-	1.43(13)	48.6	53.5
08/17/83	47	223	47.4	+/-	.94(13)	45.4	49.0
08/18/83	47	224	50.1	+/-	1.70(13)	47.5	53.2
08/19/83	47	225	52.9	+/-	2.89(14)	48.2	55.8
WEEK SUMMARY			AV = 50.3		n = 5	45.4	55.8
08/22/83	48	226	51.9	+/-	1.02(14)	50.2	53.5
08/23/83	48	227	56.0	+/-	2.35(14)	53.5	60.8
08/24/83	48	228	52.3	+/-	1.24(14)	50.0	54.1
08/25/83	48	229	49.8	+/-	1.81(13)	46.6	52.7
08/26/83	48	230	47.5	+/-	1.37(14)	46.3	51.7
WEEK SUMMARY			AV = 51.5		n = 5	46.3	60.8
08/29/83	49	231	53.0	+/-	1.34(12)	50.2	54.3
08/30/83	49	232	52.0	+/-	.91(11)	50.7	53.4
08/31/83	49	233	48.8	+/-	.63(13)	47.9	49.9
WEEK SUMMARY			AV = 51.3		n = 3	47.9	54.3
REPORT SUMMARY			AV = 52.8		n = 23	44.8	62.2



H - HOLIDAY N - OTHER O - OFF SCALE

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                         CHAMBER CONCENTRATIONS  EDC
                   74528:  ETHYLENE DICHLORIDE 50 PPM
                            WEEK 49 THRU 53
             EXPOSURE     EXPOSURE                                    MINIMUM      MAXIMUM
   DATE        WEEK         DAY        MEAN +/- S.D. (n)              READING      READING
 --------    --------    --------    ------------------------        --------     --------
 09/01/83       49          234         55.0  +/-   2.12(14)            48.6         58.0
 09/02/83       49          235         49.7  +/-   1.76(13)            46.9         52.2
 WEEK SUMMARY                   AV = 52.4           n =    2            46.9         58.0
 -------------------------------------------------------------------------------------------
 09/05/83       50                          HOLIDAY
 09/06/83       50          236         48.0  +/-   1.60(13)            44.4         50.7
 09/07/83       50          237         57.3  +/-   1.57(11)            55.5         60.4
 09/08/83       50          238         52.5  +/-   2.80(14)            46.1         57.1
 09/09/83       50          239         48.5  +/-   1.47( 6)            46.7         50.2
 WEEK SUMMARY                   AV = 51.6           n =    4            44.4         60.4
 -------------------------------------------------------------------------------------------
 09/12/83       51          240         48.3  +/-   1.42( 8)            46.4         50.9
 09/13/83       51          241         49.0  +/-   2.58( 8)            45.6         52.7
 09/14/83       51          242         48.2  +/-    .81( 8)            47.3         49.5
 09/15/83       51          243         49.3  +/-   2.09( 9)            46.5         53.5
 09/16/83       51          244         49.2  +/-   2.66( 8)            46.1         53.9
 WEEK SUMMARY                   AV = 48.8           n =    5            45.6         53.9
 -------------------------------------------------------------------------------------------
 09/19/83       52          245         55.8  +/-   1.88(10)            50.8         57.6
 09/20/83       52          246         51.1  +/-   1.26(12)            47.6         52.1
 09/21/83       52          247         50.4  +/-    .87(11)            48.9         51.5
 09/22/83       52          248         52.0  +/-    .52(13)            51.5         53.3
 09/23/83       52          249         48.8  +/-    .77(13)            48.0         51.0
 WEEK SUMMARY                   AV = 51.6           n =    5            47.6         57.6
 -------------------------------------------------------------------------------------------
 09/26/83       53          250         53.0  +/-   1.28(12)            50.3         54.4
 09/27/83       53          251         50.2  +/-    .47(13)            49.5         51.0
 09/28/83       53          252         51.0  +/-   1.12(13)            49.1         52.3
 09/29/83       53          253         50.5  +/-   1.99(12)            49.0         54.7
 09/30/83       53          254         49.7  +/-   1.11( 9)            47.5         50.8
 WEEK SUMMARY                   AV = 50.9           n =    5            47.5         54.7
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 REPORT SUMMARY                 AV = 50.8           n =   21            44.4         60.4
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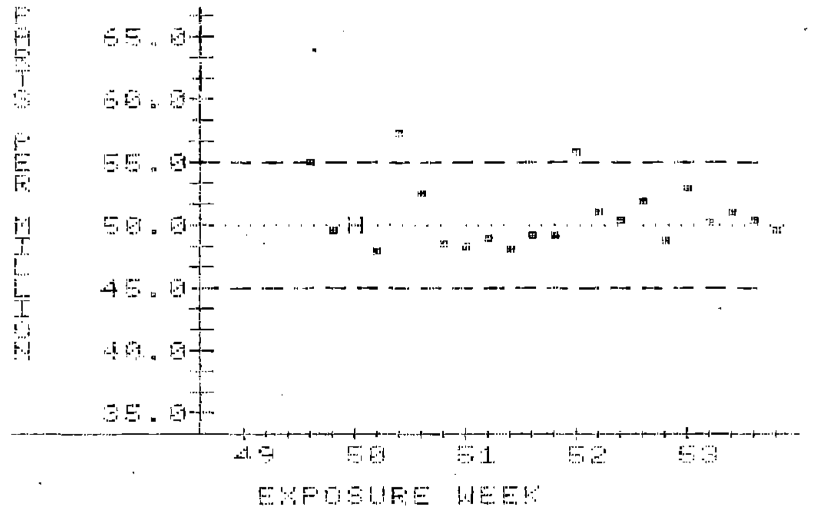
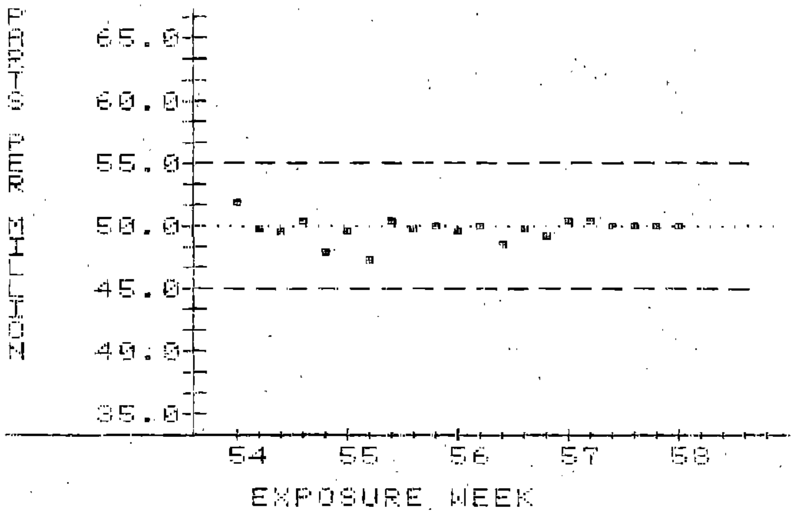


H - HOLIDAY   N - OTHER   O - OFF SCALE

CHAMBER CONCENTRATIONS EDC
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 54 THRU 58

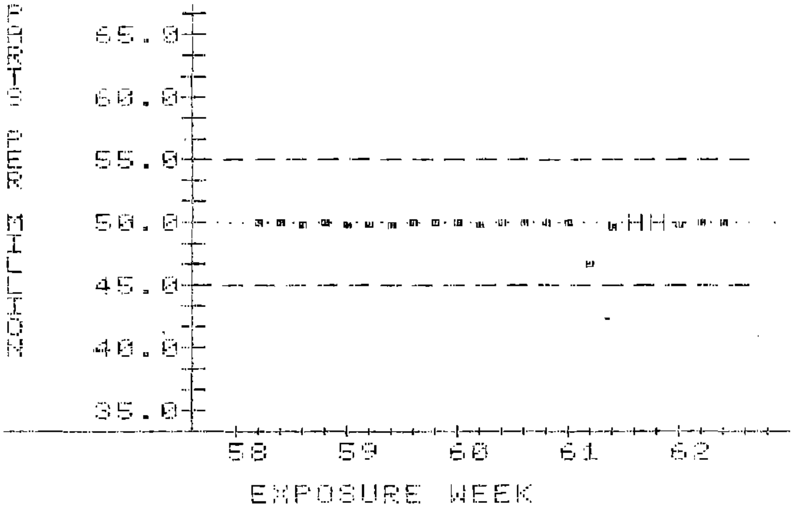
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)			MINIMUM READING	MAXIMUM READING
10/03/83	54	255	51.9	+/-	1.26(12)	50.4	55.4
10/04/83	54	256	49.8	+/-	.89(13)	47.9	50.8
10/05/83	54	257	49.6	+/-	1.30(10)	46.8	50.6
10/06/83	54	258	50.4	+/-	2.61(13)	47.0	55.7
10/07/83	54	259	47.9	+/-	3.17(12)	44.2	55.4
WEEK SUMMARY			AV = 49.9		n = 5	44.2	55.7
10/10/83	55	260	49.6	+/-	5.74(11)	37.8	62.3
10/11/83	55	261	47.4	+/-	1.43(10)	45.1	49.3
10/12/83	55	262	50.5	+/-	1.23(11)	48.9	52.2
10/13/83	55	263	49.8	+/-	.92(12)	47.1	50.6
10/14/83	55	264	50.1	+/-	.83(13)	49.6	52.8
WEEK SUMMARY			AV = 49.5		n = 5	37.8	62.3
10/17/83	56	265	49.6	+/-	.47(13)	49.1	50.5
10/18/83	56	266	50.1	+/-	.78(13)	48.1	50.8
10/19/83	56	267	48.5	+/-	1.26(13)	47.1	51.2
10/20/83	56	268	49.8	+/-	.97(13)	47.6	51.3
10/21/83	56	269	49.2	+/-	.44(13)	48.7	50.2
WEEK SUMMARY			AV = 49.4		n = 5	47.1	51.3
10/24/83	57	270	50.5	+/-	2.02(12)	45.2	53.0
10/25/83	57	271	50.4	+/-	.55(13)	49.6	51.7
10/26/83	57	272	50.0	+/-	.66(13)	48.8	51.0
10/27/83	57	273	50.1	+/-	1.02(13)	48.4	52.2
10/28/83	57	274	50.0	+/-	.90(13)	48.1	51.4
WEEK SUMMARY			AV = 50.2		n = 5	45.2	53.0
10/31/83	58	275	50.1	+/-	1.18(13)	48.9	53.8
WEEK SUMMARY			AV = 50.1		n = 1	48.9	53.8
REPORT SUMMARY			AV = 49.8		n = 21	37.8	62.3



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS EDC
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 58 THRU 62

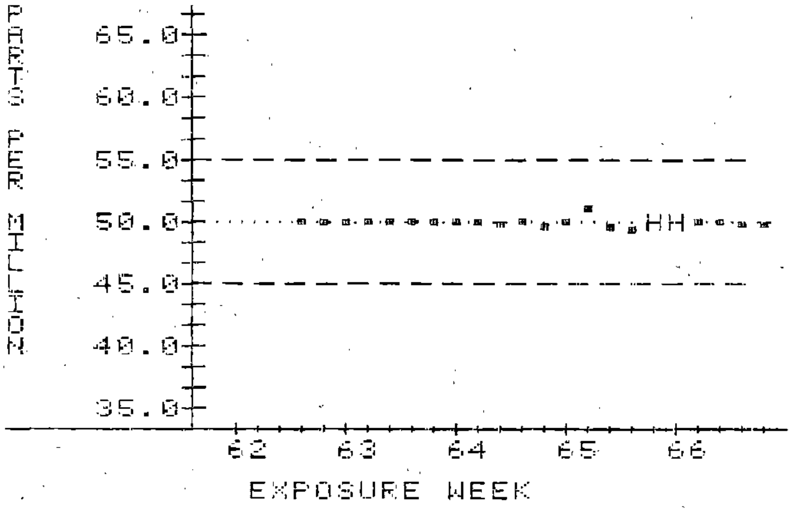
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)			MINIMUM READING	MAXIMUM READING
11/01/83	58	276	50.0	+/-	1.16(13)	48.6	53.2
11/02/83	58	277	50.1	+/-	1.44(13)	48.1	54.2
11/03/83	58	278	49.9	+/-	1.50(13)	48.6	54.4
11/04/83	58	279	50.0	+/-	.64(13)	49.0	51.1
WEEK SUMMARY			AV = 50.0		n = 4	48.1	54.4
11/07/83	59	280	49.9	+/-	1.85(12)	45.1	51.8
11/08/83	59	281	49.9	+/-	1.02(13)	47.9	51.1
11/09/83	59	282	49.8	+/-	1.11(13)	48.4	52.6
11/10/83	59	283	50.1	+/-	2.15(13)	45.9	53.3
11/11/83	59	284	50.0	+/-	.88(13)	48.9	52.5
WEEK SUMMARY			AV = 49.9		n = 5	45.1	53.3
11/14/83	60	285	50.0	+/-	1.16(10)	48.7	52.2
11/15/83	60	286	49.9	+/-	1.37(12)	47.6	52.9
11/16/83	60	287	50.0	+/-	1.81(12)	46.0	53.0
11/17/83	60	288	50.1	+/-	.78(11)	48.9	51.4
11/18/83	60	289	50.0	+/-	1.35(12)	48.6	53.6
WEEK SUMMARY			AV = 50.0		n = 5	46.0	53.6
11/21/83	61	290	50.0	+/-	2.61(10)	44.9	52.2
11/22/83	61	291	46.8	+/-	1.04(11)	45.0	48.1
11/23/83	61	292	49.7	+/-	1.44(13)	46.9	52.3
11/24/83	61		HOLIDAY				
11/25/83	61		HOLIDAY				
WEEK SUMMARY			AV = 48.8		n = 3	44.9	52.3
11/28/83	62	293	49.8	+/-	.81(13)	47.5	50.6
11/29/83	62	294	50.1	+/-	1.85(13)	45.7	52.2
11/30/83	62	295	50.0	+/-	.65(13)	48.7	51.0
WEEK SUMMARY			AV = 50.0		n = 3	45.7	52.2
REPORT SUMMARY			AV = 49.8		n = 20	44.9	54.4



H - HOLIDAY   N - OTHER   O - OFF SCALE

CHAMBER CONCENTRATIONS EDC
7452B: ETHYLENE DICHLORIDE 50 PPM
WEEK 62 THRU 66

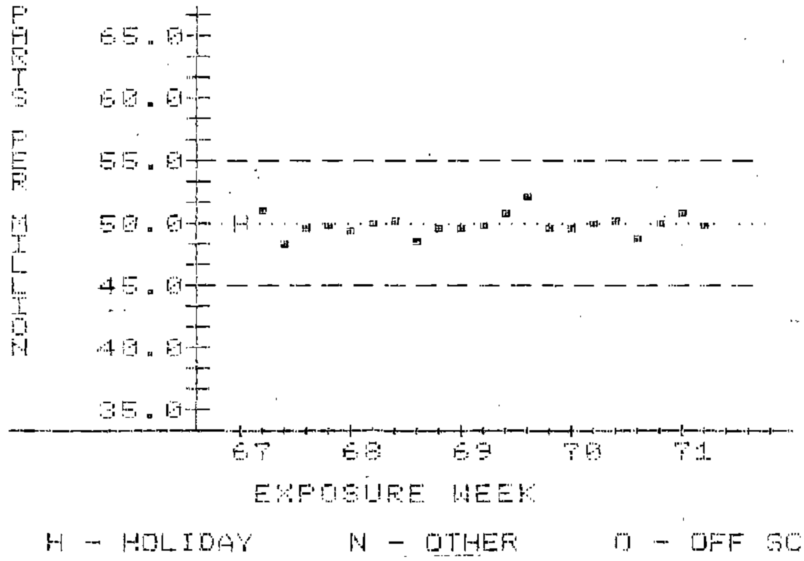
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
12/01/83	62	296	50.0 +/- 1.05(13)	48.5	52.2
12/02/83	62	297	50.1 +/- 1.51(13)	46.7	52.7
WEEK SUMMARY			AV = 50.1 n = 2	46.7	52.7
12/05/83	63	298	50.0 +/- 1.08(12)	48.8	52.6
12/06/83	63	299	50.0 +/- 1.29(13)	48.6	53.5
12/07/83	63	300	50.0 +/- .95(13)	48.9	52.0
12/08/83	63	301	50.0 +/- .73(13)	48.6	50.9
12/09/83	63	302	50.1 +/- .82(13)	48.3	51.6
WEEK SUMMARY			AV = 50.0 n = 5	48.3	53.5
12/12/83	64	303	50.1 +/- .86(13)	48.6	51.7
12/13/83	64	304	50.1 +/- 1.34(13)	46.7	51.1
12/14/83	64	305	49.8 +/- .78(12)	48.5	51.2
12/15/83	64	306	50.1 +/- .98(13)	48.7	51.4
12/16/83	64	307	49.7 +/- 1.94(13)	46.3	52.2
WEEK SUMMARY			AV = 50.0 n = 5	46.3	52.2
12/19/83	65	308	50.0 +/- 3.02(9)	43.6	54.8
12/20/83	65	309	51.1 +/- 1.30(12)	50.2	55.0
12/21/83	65	310	49.7 +/- .87(10)	48.2	50.8
12/22/83	65	311	49.4 +/- .72(13)	48.2	50.4
12/23/83	65		HOLIDAY		
WEEK SUMMARY			AV = 50.1 n = 4	43.6	55.0
12/26/83	66		HOLIDAY		
12/27/83	66	312	50.0 +/- .94(13)	47.4	50.9
12/28/83	66	313	50.1 +/- .90(13)	47.9	51.4
12/29/83	66	314	49.9 +/- .79(13)	49.0	51.5
12/30/83	66	315	49.8 +/- .65(13)	48.5	50.8
WEEK SUMMARY			AV = 50.0 n = 4	47.4	51.5
REPORT SUMMARY			AV = 50.0 n = 20	43.6	55.0



H - HOLIDAY N - OTHER O - OFF SCALE

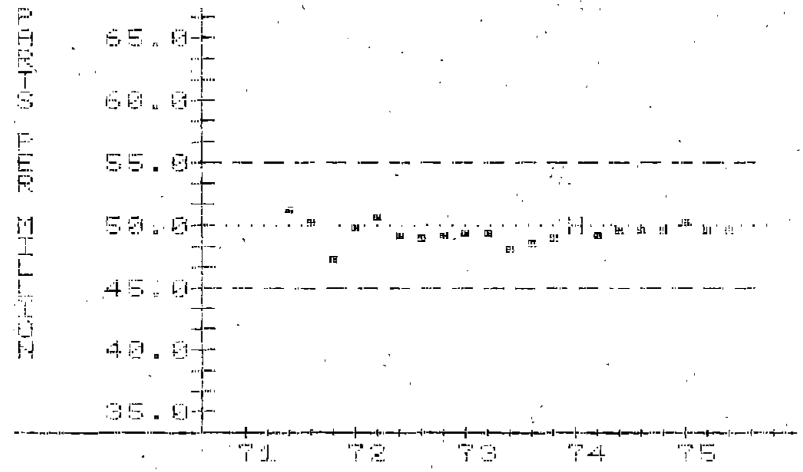
CHAMBER CONCENTRATIONS EDC
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 67 THRU 71

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
01/02/84	67		HOLIDAY		
01/03/84	67	316	51.0 +/- 1.16(12)	49.3	53.5
01/04/84	67	317	48.4 +/- 2.24(11)	43.0	50.1
01/05/84	67	318	49.7 +/- .49(14)	48.6	50.6
01/06/84	67	319	49.9 +/- 1.50(13)	48.4	54.3
WEEK SUMMARY			AV = 49.8 n = 4	43.0	54.3
01/09/84	68	320	49.4 +/- .89(13)	48.1	50.7
01/10/84	68	321	50.0 +/- 1.70(14)	45.6	51.7
01/11/84	68	322	50.3 +/- 2.28(13)	45.3	54.5
01/12/84	68	323	48.5 +/- 2.96(13)	42.1	50.8
01/13/84	68	324	49.7 +/- 1.55(13)	46.1	51.4
WEEK SUMMARY			AV = 49.6 n = 5	42.1	54.5
01/16/84	69	325	49.6 +/- .88(13)	48.5	51.4
01/17/84	69	326	49.8 +/- 1.38(13)	46.5	50.9
01/18/84	69	327	50.8 +/- 2.63(14)	48.9	58.1
01/19/84	69	328	52.1 +/- 10.51(15)	46.7	89.9
01/20/84	69	329	49.6 +/- .63(16)	47.9	50.6
WEEK SUMMARY			AV = 50.4 n = 5	46.5	89.9
01/23/84	70	330	49.7 +/- 1.62(16)	44.7	52.6
01/24/84	70	331	50.0 +/- 1.65(16)	45.2	51.3
01/25/84	70	332	50.2 +/- 1.37(16)	47.4	52.2
01/26/84	70	333	48.9 +/- 1.81(11)	45.4	51.2
01/27/84	70	334	50.1 +/- 1.26(14)	45.8	50.9
WEEK SUMMARY			AV = 49.8 n = 5	44.7	52.6
01/30/84	71	335	50.9 +/- 1.49(12)	49.7	55.3
01/31/84	71	336	49.8 +/- .77(16)	48.4	51.2
WEEK SUMMARY			AV = 50.4 n = 2	48.4	55.3
REPORT SUMMARY			AV = 49.9 n = 21	42.1	89.9



CHAMBER CONCENTRATIONS EDC
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 71 THRU 75

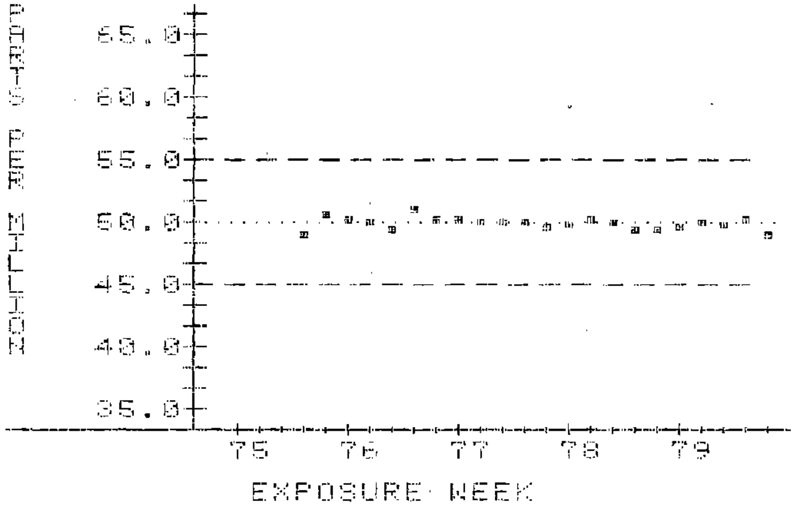
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
02/01/84	71	337	51.3 +/- 1.76(10)	49.7	55.8
02/02/84	71	338	50.2 +/- 1.96(15)	48.1	56.5
02/03/84	71	339	47.4 +/- 5.25(12)	31.7	50.7
WEEK SUMMARY			AV = 49.6 n = 3	31.7	56.5
02/06/84	72	340	49.8 +/- 1.04(14)	47.7	51.4
02/07/84	72	341	50.6 +/- 1.05(14)	48.3	52.0
02/08/84	72	342	49.3 +/- 1.00(15)	47.0	50.4
02/09/84	72	343	49.0 +/- 1.03(15)	46.2	51.0
02/10/84	72	344	49.3 +/- 1.44(15)	45.1	50.8
WEEK SUMMARY			AV = 49.6 n = 5	45.1	52.0
02/13/84	73	345	49.4 +/- .43(14)	48.3	50.0
02/14/84	73	346	49.4 +/- .72(15)	48.5	51.3
02/15/84	73	347	48.2 +/- 1.21(15)	44.4	49.1
02/16/84	73	348	48.5 +/- .77(16)	46.0	49.3
02/17/84	73	349	49.0 +/- 1.03(15)	45.9	50.0
WEEK SUMMARY			AV = 48.9 n = 5	44.4	51.3
02/20/84	74		HOLIDAY		
02/21/84	74	350	49.3 +/- 1.11(15)	45.7	50.3
02/22/84	74	351	49.7 +/- 1.40(15)	47.2	51.4
02/23/84	74	352	49.7 +/- .73(15)	48.3	50.4
02/24/84	74	353	49.6 +/- .60(15)	47.9	50.4
WEEK SUMMARY			AV = 49.6 n = 4	45.7	51.4
02/27/84	75	354	50.3 +/- 2.41(15)	45.5	56.6
02/28/84	75	355	49.7 +/- 1.26(11)	46.7	50.3
02/29/84	75	356	49.7 +/- .66(12)	48.2	50.6
WEEK SUMMARY			AV = 49.9 n = 3	45.5	56.6
REPORT SUMMARY			AV = 49.5 n = 20	31.7	56.6



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS EDC
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 75 THRU 79

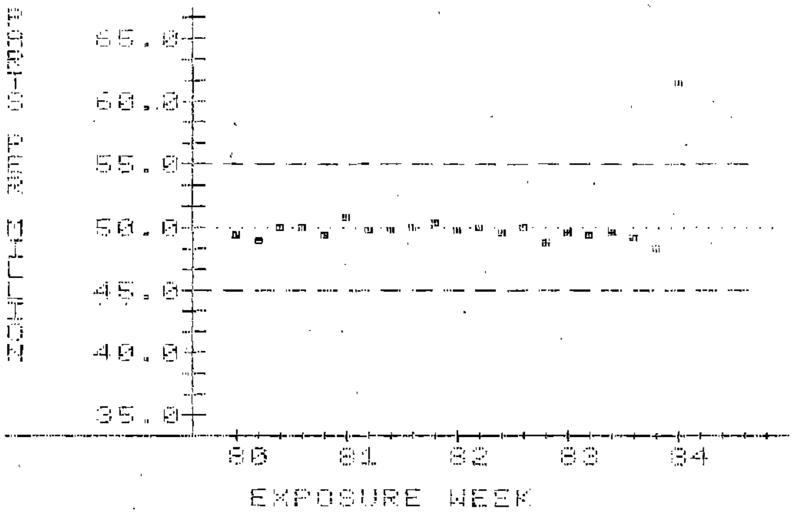
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
03/01/84	75	357	49.1 +/- 1.69(15)	44.1	52.2
03/02/84	75	358	50.7 +/- .54(14)	49.8	52.0
WEEK SUMMARY			AV = 49.9 n = 2	44.1	52.2
03/05/84	76	359	50.3 +/- .56(15)	48.7	51.2
03/06/84	76	360	50.1 +/- .85(15)	47.2	50.8
03/07/84	76	361	49.4 +/- .83(15)	46.7	50.1
03/08/84	76	362	51.0 +/- .30(15)	50.3	51.5
03/09/84	76	363	50.2 +/- .91(15)	49.2	52.8
WEEK SUMMARY			AV = 50.2 n = 5	46.7	52.8
03/12/84	77	364	50.2 +/- 1.49(15)	46.1	51.8
03/13/84	77	365	50.0 +/- .91(15)	47.4	51.0
03/14/84	77	366	50.0 +/- .86(15)	48.6	51.2
03/15/84	77	367	50.1 +/- 2.25(3)	47.9	52.4
03/16/84	77	368	49.6 +/- .98(15)	47.9	51.3
WEEK SUMMARY			AV = 50.0 n = 5	46.1	52.4
03/19/84	78	369	49.9 +/- 1.24(13)	47.4	51.5
03/20/84	78	370	50.3 +/- 2.09(13)	46.7	52.6
03/21/84	78	371	50.1 +/- .71(13)	47.9	50.7
03/22/84	78	372	49.5 +/- .43(14)	48.9	50.1
03/23/84	78	373	49.5 +/- .93(13)	47.4	51.0
WEEK SUMMARY			AV = 49.9 n = 5	46.7	52.6
03/26/84	79	374	49.6 +/- 1.55(14)	46.1	52.3
03/27/84	79	375	50.1 +/- 1.67(12)	48.8	54.9
03/28/84	79	376	49.9 +/- .86(15)	48.4	51.4
03/29/84	79	377	50.2 +/- 1.07(15)	48.6	52.6
03/30/84	79	378	49.0 +/- .84(14)	47.9	50.1
WEEK SUMMARY			AV = 49.8 n = 5	46.1	54.9
REPORT SUMMARY			AV = 49.9 n = 22	44.1	54.9



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS EDC
7452B: ETHYLENE DICHLORIDE 50 PPM
WEEK 80 THRU 84

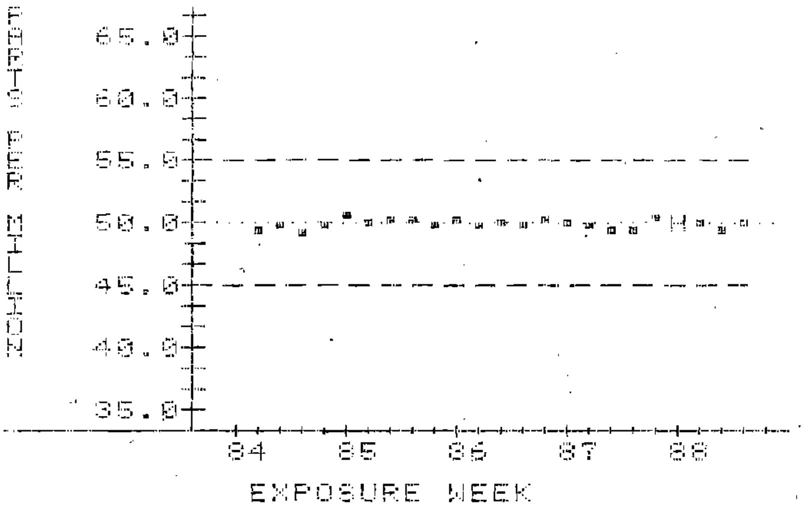
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
04/02/84	80	379	49.5 +/- 1.42(15)	46.8	52.2
04/03/84	80	380	49.1 +/- 1.04(13)	47.6	50.9
04/04/84	80	381	50.0 +/- .58(15)	48.8	50.9
04/05/84	80	382	50.1 +/- .83(15)	48.9	51.6
04/06/84	80	383	49.5 +/- 1.38(15)	47.6	53.5
WEEK SUMMARY			AV = 49.6 n = 5	46.8	53.5
04/09/84	81	384	50.9 +/- .82(15)	49.0	52.0
04/10/84	81	385	49.9 +/- 1.06(14)	46.7	51.2
04/11/84	81	386	49.8 +/- .73(14)	48.8	51.5
04/12/84	81	387	50.0 +/- .62(14)	49.4	51.8
04/13/84	81	388	50.5 +/- .67(15)	48.9	52.2
WEEK SUMMARY			AV = 50.2 n = 5	46.7	52.2
04/16/84	82	389	49.8 +/- 1.11(14)	46.4	51.0
04/17/84	82	390	50.0 +/- .96(14)	47.1	51.0
04/18/84	82	391	49.7 +/- 1.30(14)	48.1	52.0
04/19/84	82	392	50.0 +/- .95(15)	49.0	52.6
04/20/84	82	393	48.7 +/- 1.31(14)	45.9	50.6
WEEK SUMMARY			AV = 49.6 n = 5	45.9	52.6
04/23/84	83	394	49.6 +/- .87(13)	48.2	51.1
04/24/84	83	395	49.4 +/- .75(14)	48.8	51.8
04/25/84	83	396	49.7 +/- 1.17(14)	46.1	51.0
04/26/84	83	397	49.3 +/- .84(15)	47.7	50.9
04/27/84	83	398	48.4 +/- .33(13)	47.9	49.0
WEEK SUMMARY			AV = 49.3 n = 5	46.1	51.8
04/30/84	84	399	61.5 +/- 1.43(14)	58.7	64.9
WEEK SUMMARY			AV = 61.5 n = 1	58.7	64.9
REPORT SUMMARY			AV = 50.3 n = 21	45.9	64.9



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS , EDC
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 84 THRU 88

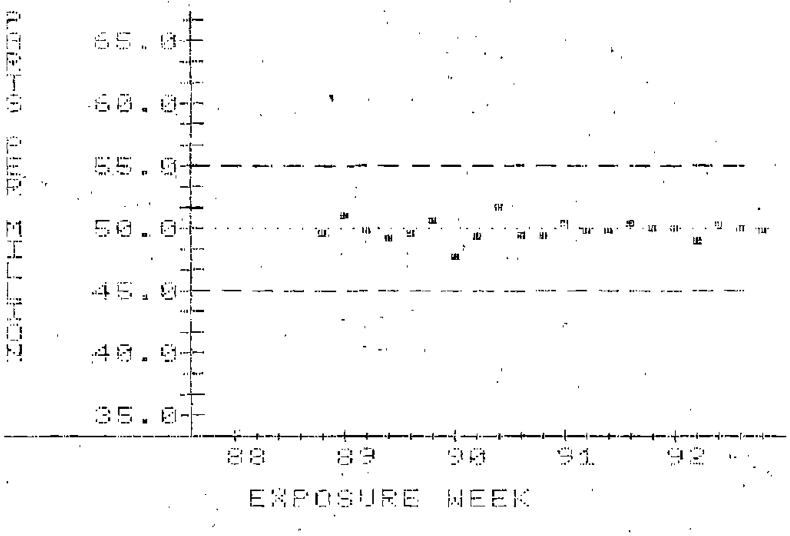
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
05/01/84	84	400	49.4 +/- 1.11(14)	47.2	51.7
05/02/84	84	401	49.8 +/- 1.78(14)	46.2	51.7
05/03/84	84	402	49.3 +/- .65(13)	47.7	50.4
05/04/84	84	403	49.8 +/- 1.23(14)	47.8	51.4
WEEK SUMMARY			AV = 49.6 n = 4	46.2	51.7
05/07/84	85	404	50.6 +/- 1.69(15)	45.2	52.0
05/08/84	85	405	50.1 +/- 1.55(13)	47.0	52.1
05/09/84	85	406	50.3 +/- 1.02(11)	48.3	51.8
05/10/84	85	407	50.2 +/- .78(14)	48.8	51.3
05/11/84	85	408	49.9 +/- .46(13)	49.2	50.7
WEEK SUMMARY			AV = 50.2 n = 5	45.2	52.1
05/14/84	86	409	50.3 +/- .77(13)	48.3	51.3
05/15/84	86	410	49.8 +/- 1.47(15)	47.6	52.3
05/16/84	86	411	50.1 +/- 1.10(15)	46.8	51.4
05/17/84	86	412	49.8 +/- 2.50(15)	45.0	55.0
05/18/84	86	413	50.3 +/- 1.65(14)	45.1	51.9
WEEK SUMMARY			AV = 50.1 n = 5	45.0	55.0
05/21/84	87	414	50.1 +/- 1.20(14)	47.5	51.7
05/22/84	87	415	49.9 +/- .76(15)	48.3	50.7
05/23/84	87	416	49.4 +/- .89(12)	47.0	50.7
05/24/84	87	417	49.5 +/- .99(9)	47.4	50.6
05/25/84	87	418	50.4 +/- 1.62(12)	46.7	51.8
WEEK SUMMARY			AV = 49.9 n = 5	46.7	51.8
05/28/84	88		HOLIDAY		
05/29/84	88	419	50.1 +/- 2.22(15)	45.0	51.8
05/30/84	88	420	49.5 +/- 1.16(13)	46.9	51.4
05/31/84	88	421	50.1 +/- .64(14)	49.4	51.2
WEEK SUMMARY			AV = 49.9 n = 3	45.0	51.8
REPORT SUMMARY			AV = 49.9 n = 22	45.0	55.0



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS EDC
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 88 THRU 92

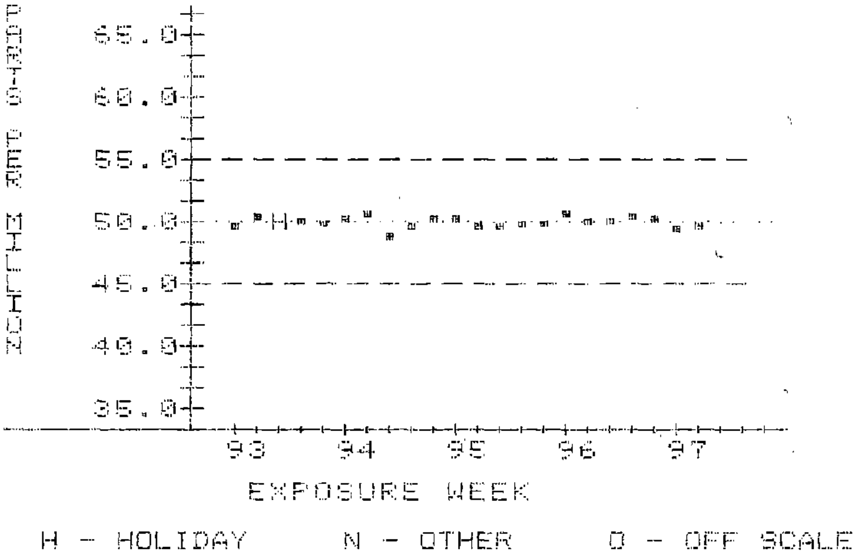
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)			MINIMUM READING	MAXIMUM READING
06/01/84	88	422	49.7	+/-	1.61(14)	45.6	52.3
WEEK SUMMARY			AV = 49.7		n = 1	45.6	52.3
06/04/84	89	423	51.0	+/-	.82(12)	49.4	52.8
06/05/84	89	424	49.9	+/-	1.50(15)	48.1	54.2
06/06/84	89	425	49.2	+/-	.96(13)	47.3	50.1
06/07/84	89	426	49.6	+/-	1.38(13)	46.0	51.0
06/08/84	89	427	50.6	+/-	1.02(13)	49.2	53.4
WEEK SUMMARY			AV = 50.1		n = 5	46.0	54.2
06/11/84	90	428	47.7	+/-	4.31(15)	37.3	56.9
06/12/84	90	429	49.4	+/-	.42(12)	48.5	50.1
06/13/84	90	430	51.6	+/-	.53(13)	50.9	52.5
06/14/84	90	431	49.5	+/-	.19(13)	49.3	49.8
06/15/84	90	432	49.4	+/-	.61(15)	48.6	50.8
WEEK SUMMARY			AV = 49.5		n = 5	37.3	56.9
06/18/84	91	433	50.5	+/-	2.91(15)	45.7	54.9
06/19/84	91	434	49.9	+/-	1.79(14)	46.9	52.8
06/20/84	91	435	49.8	+/-	1.36(15)	47.9	51.6
06/21/84	91	436	50.4	+/-	.50(15)	49.1	51.0
06/22/84	91	437	50.1	+/-	1.08(15)	47.7	52.0
WEEK SUMMARY			AV = 50.1		n = 5	45.7	54.9
06/25/84	92	438	50.0	+/-	1.82(14)	46.5	55.4
06/26/84	92	439	49.1	+/-	.85(14)	47.4	51.2
06/27/84	92	440	50.2	+/-	1.22(15)	47.4	51.6
06/28/84	92	441	50.1	+/-	.41(15)	49.6	51.3
06/29/84	92	442	49.9	+/-	2.18(14)	44.3	52.5
WEEK SUMMARY			AV = 49.9		n = 5	44.3	55.4
REPORT SUMMARY			AV = 49.9		n = 21	37.3	56.9



H - HOLIDAY N - OTHER O - OFF SCALE

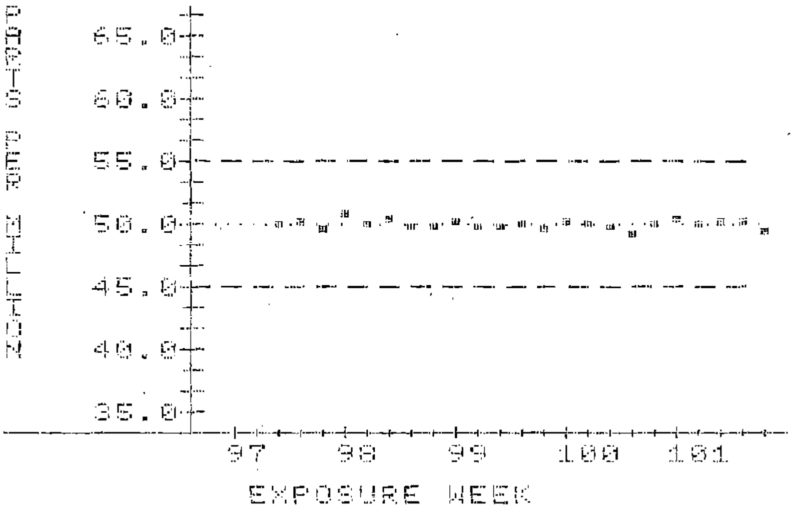
CHAMBER CONCENTRATIONS EDC
7452B: ETHYLENE DICHLORIDE 50 PPM
WEEK 93 THRU 97

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)			MINIMUM READING	MAXIMUM READING
07/02/84	93	443	49.6	+/-	2.50(15)	41.6	51.8
07/03/84	93	444	50.4	+/-	.89(15)	49.3	53.2
07/04/84	93		HOLIDAY				
07/05/84	93	445	50.1	+/-	1.57(15)	46.4	52.1
07/06/84	93	446	49.8	+/-	1.57(15)	45.5	53.6
WEEK SUMMARY			AV = 50.0		n = 4	41.6	53.6
07/09/84	94	447	50.2	+/-	2.05(14)	45.4	53.2
07/10/84	94	448	50.6	+/-	1.01(13)	48.9	51.9
07/11/84	94	449	48.8	+/-	2.86(14)	39.1	50.3
07/12/84	94	450	49.7	+/-	1.77(14)	45.2	51.8
07/13/84	94	451	50.2	+/-	.76(15)	48.5	51.2
WEEK SUMMARY			AV = 49.9		n = 5	39.1	53.2
07/16/84	95	452	50.3	+/-	1.14(15)	48.7	51.9
07/17/84	95	453	49.6	+/-	1.37(14)	48.0	52.8
07/18/84	95	454	49.6	+/-	.55(15)	48.9	50.6
07/19/84	95	455	49.8	+/-	.90(15)	48.6	51.5
07/20/84	95	456	49.8	+/-	.91(15)	48.4	52.1
WEEK SUMMARY			AV = 49.8		n = 5	48.0	52.8
07/23/84	96	457	50.7	+/-	1.05(14)	49.3	53.3
07/24/84	96	458	50.1	+/-	.68(14)	49.2	51.9
07/25/84	96	459	50.0	+/-	1.02(14)	48.0	51.3
07/26/84	96	460	50.5	+/-	.79(15)	49.3	52.2
07/27/84	96	461	50.2	+/-	.72(15)	48.6	51.3
WEEK SUMMARY			AV = 50.3		n = 5	48.0	53.3
07/30/84	97	462	49.4	+/-	1.13(14)	47.5	50.9
07/31/84	97	463	49.6	+/-	.88(14)	47.5	51.4
WEEK SUMMARY			AV = 49.5		n = 2	47.5	51.4
REPORT SUMMARY			AV = 50.0		n = 21	39.1	53.6



CHAMBER CONCENTRATIONS EDC
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 97 THRU 101

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
08/01/84	97	464	50.1 +/- 1.07(15)	48.5	52.4
08/02/84	97	465	50.2 +/- 1.53(14)	47.7	53.7
08/03/84	97	466	49.7 +/- 1.22(15)	46.5	51.8
WEEK SUMMARY			AV = 50.0 n = 3	46.5	53.7
08/06/84	98	467	50.8 +/- .87(14)	49.8	53.0
08/07/84	98	468	50.1 +/- .86(15)	47.7	51.1
08/08/84	98	469	50.5 +/- .74(15)	48.6	51.3
08/09/84	98	470	49.9 +/- 1.44(14)	47.2	51.2
08/10/84	98	471	49.9 +/- 1.68(15)	45.5	51.9
WEEK SUMMARY			AV = 50.2 n = 5	45.5	53.0
08/13/84	99	472	50.2 +/- 1.78(15)	47.1	53.1
08/14/84	99	473	49.8 +/- .83(15)	48.3	51.4
08/15/84	99	474	49.9 +/- 1.47(15)	47.5	52.6
08/16/84	99	475	50.0 +/- 1.24(14)	47.5	51.5
08/17/84	99	476	49.7 +/- 1.85(12)	44.7	52.1
WEEK SUMMARY			AV = 49.9 n = 5	44.7	53.1
08/20/84	100	477	50.2 +/- 1.44(15)	46.3	52.0
08/21/84	100	478	50.1 +/- .73(15)	48.1	50.9
08/22/84	100	479	49.9 +/- .94(15)	47.9	51.3
08/23/84	100	480	49.2 +/- .74(15)	47.5	50.0
08/24/84	100	481	50.0 +/- .64(14)	48.2	50.6
WEEK SUMMARY			AV = 49.9 n = 5	46.3	52.0
08/27/84	101	482	50.5 +/- 1.51(15)	48.7	53.1
08/28/84	101	483	50.1 +/- .82(14)	49.3	52.0
08/29/84	101	484	50.2 +/- 1.87(15)	48.8	54.2
08/30/84	101	485	50.2 +/- 1.32(15)	45.8	52.0
08/31/84	101	486	49.5 +/- 1.06(15)	47.8	50.3
WEEK SUMMARY			AV = 50.1 n = 5	45.8	54.2
REPORT SUMMARY			AV = 50.0 n = 23	44.7	54.2



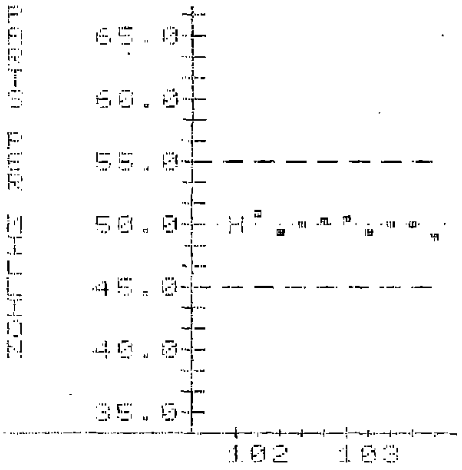
H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS EDC

74528: ETHYLENE DICHLORIDE 50 PPM

WEEK 102 THRU 103

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)			MINIMUM READING	MAXIMUM READING
09/03/84	102		HOLIDAY				
09/04/84	102	487	50.8	+/-	.88(15)	49.2	52.2
09/05/84	102	488	49.4	+/-	.47(15)	48.8	50.4
09/06/84	102	489	50.0	+/-	.84(15)	48.4	51.4
09/07/84	102	490	50.2	+/-	1.02(15)	48.0	51.8
WEEK SUMMARY			AV = 50.1		n = 4	48.0	52.2
09/10/84	103	491	50.4	+/-	1.21(15)	47.6	51.9
09/11/84	103	492	49.4	+/-	1.23(15)	47.5	52.3
09/12/84	103	493	50.1	+/-	1.13(15)	47.7	52.6
09/13/84	103	494	50.1	+/-	1.04(14)	48.1	51.8
09/14/84	103	495	49.1	+/-	.51(15)	48.0	49.7
WEEK SUMMARY			AV = 49.8		n = 5	47.5	52.6
REPORT SUMMARY			AV = 49.9		n = 9	47.5	52.6



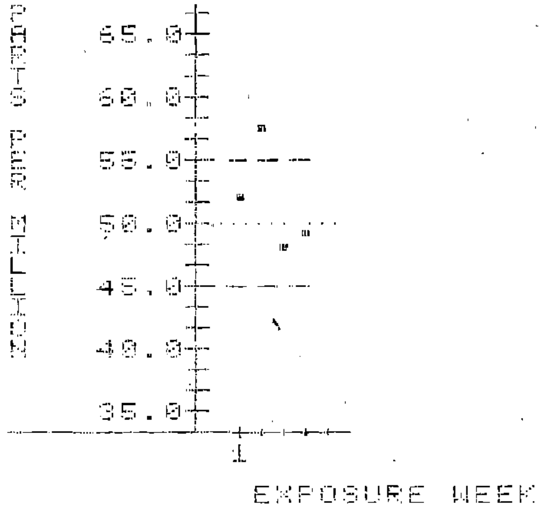
EXPOSURE WEEK

H - HOLIDAY N - OTHER O - OFF SCALE

EDC/DS CHAMBER CONCENTRATIONS (K4)

CHAMBER CONCENTRATIONS -- EDC/DS
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 1 THRU 1

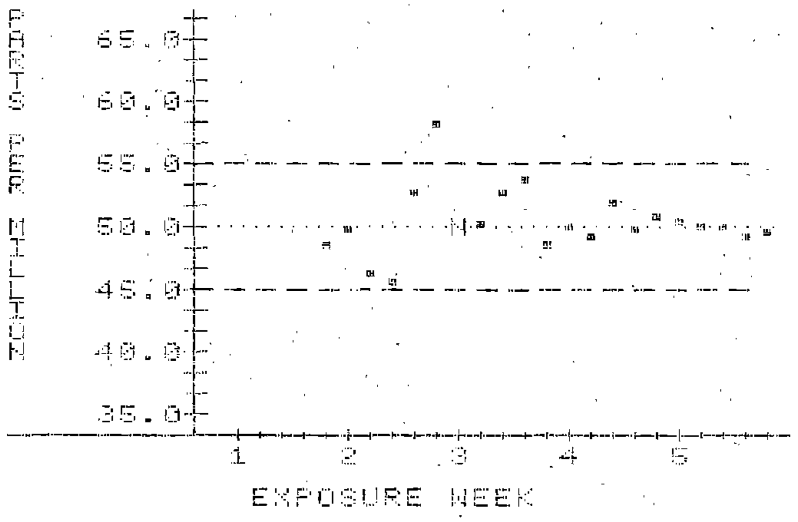
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)			MINIMUM READING	MAXIMUM READING
09/27/82	1	1	52.2	+/-	1.60(10)	48.9	53.8
09/28/82	1	2	57.5	+/-	16.22(12)	35.5	72.7
09/29/82	1	3	48.2	+/-	1.64(10)	45.5	50.0
09/30/82	1	4	49.3	+/-	2.70(16)	44.6	52.1
WEEK SUMMARY			AV = 51.8		n = 4	35.5	72.7
REPORT SUMMARY			AV = 51.8		n = 4	35.5	72.7



H - HOLIDAY M - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/DS
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 1 THRU 5

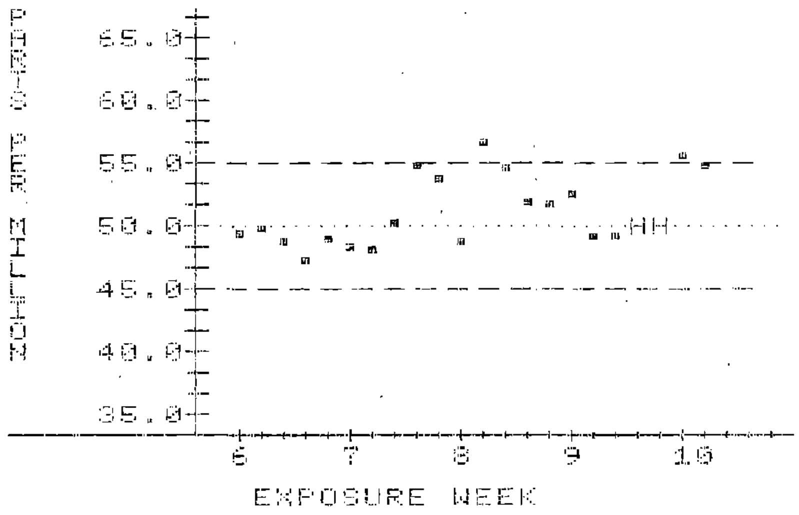
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)		MINIMUM READING	MAXIMUM READING
10/01/82	1	5	48.5 +/-	.88(14)	47.2	50.4
WEEK SUMMARY			AV = 48.5	n = 1	47.2	50.4
10/04/82	2	6	49.9 +/-	3.94(12)	42.4	56.4
10/05/82	2	7	46.3 +/-	4.33(9)	40.0	54.3
10/06/82	2	8	45.6 +/-	6.93(14)	31.3	50.4
10/07/82	2	9	52.8 +/-	1.07(11)	51.2	55.0
10/08/82	2	10	58.0 +/-	4.26(12)	54.8	66.9
WEEK SUMMARY			AV = 50.5	n = 5	31.3	66.9
10/11/82	3		NON-EXPOSURE			
10/12/82	3	11	50.2 +/-	3.86(13)	42.8	55.5
10/13/82	3	12	52.7 +/-	8.92(13)	44.6	75.7
10/14/82	3	13	53.7 +/-	4.90(14)	37.7	59.9
10/15/82	3	14	48.6 +/-	5.98(17)	39.8	62.6
WEEK SUMMARY			AV = 51.3	n = 4	37.7	75.7
10/18/82	4	15	50.0 +/-	2.79(12)	45.8	54.6
10/19/82	4	16	49.3 +/-	.30(14)	48.8	49.7
10/20/82	4	17	52.0 +/-	2.06(14)	48.5	55.3
10/21/82	4	18	49.8 +/-	2.07(17)	46.4	54.3
10/22/82	4	19	50.8 +/-	3.83(17)	48.2	65.1
WEEK SUMMARY			AV = 50.4	n = 5	45.8	65.1
10/25/82	5	20	50.4 +/-	2.30(17)	42.6	53.1
10/26/82	5	21	50.1 +/-	2.24(15)	47.5	54.9
10/27/82	5	22	50.0 +/-	1.14(11)	48.3	51.6
10/28/82	5	23	49.2 +/-	.80(16)	47.9	51.3
10/29/82	5	24	49.6 +/-	1.96(17)	45.7	51.8
WEEK SUMMARY			AV = 49.9	n = 5	42.6	54.9
REPORT SUMMARY			AV = 50.4	n = 20	31.3	75.7



H - HOLIDAY   N - OTHER   O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/DS
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 6 THRU 10

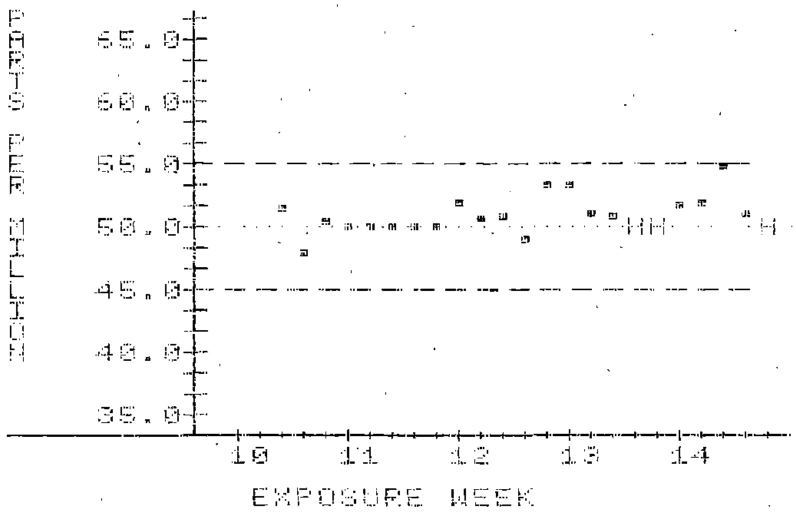
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
11/01/82	6	25	49.5 +/- 1.10(15)	46.2	50.7
11/02/82	6	26	49.9 +/- 2.67(4)	47.2	52.2
11/03/82	6	27	48.7 +/- 1.31(4)	46.8	49.6
11/04/82	6	28	47.4 +/- 2.46(6)	43.2	49.5
11/05/82	6	29	49.1 +/- 2.91(7)	45.7	53.3
WEEK SUMMARY			AV = 48.9 n = 5	43.2	53.3
11/08/82	7	30	48.4 +/- 2.26(7)	45.0	51.0
11/09/82	7	31	48.1 +/- 1.15(6)	46.6	49.8
11/10/82	7	32	50.3 +/- 1.87(7)	47.6	53.0
11/11/82	7	33	54.8 +/- 1.32(7)	53.4	56.5
11/12/82	7	34	53.8 +/- 2.67(7)	51.8	59.5
WEEK SUMMARY			AV = 51.1 n = 5	45.0	59.5
11/15/82	8	35	48.7 +/- 5.43(6)	43.0	58.2
11/16/82	8	36	56.6 +/- 4.63(8)	51.1	63.7
11/17/82	8	37	54.6 +/- 1.00(9)	52.4	55.7
11/18/82	8	38	51.8 +/- 4.40(8)	49.4	62.6
11/19/82	8	39	51.6 +/- 1.44(7)	49.2	53.3
WEEK SUMMARY			AV = 52.7 n = 5	43.0	63.7
11/22/82	9	40	52.6 +/- 2.16(14)	47.9	55.0
11/23/82	9	41	49.3 +/- 1.47(10)	47.5	51.0
11/24/82	9	42	49.3 +/- 4.03(11)	44.0	56.8
11/25/82	9		HOLIDAY		
11/26/82	9		HOLIDAY		
WEEK SUMMARY			AV = 50.4 n = 3	44.0	56.8
11/29/82	10	43	55.6 +/- 3.72(13)	50.0	60.2
11/30/82	10	44	54.7 +/- 3.26(10)	50.8	59.5
WEEK SUMMARY			AV = 55.2 n = 2	50.0	60.2
REPORT SUMMARY			AV = 51.2 n = 20	43.0	63.7



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS --- EDC/OS
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 10 THRU 14

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
12/01/82	10	45	51.5 +/- 4.14(10)	47.1	59.9
12/02/82	10	46	48.0 +/- 2.61(8)	42.7	51.6
12/03/82	10	47	50.5 +/- 1.58(10)	50.0	55.0
WEEK SUMMARY			AV = 50.0 n = 3	42.7	59.9
12/06/82	11	48	50.0 +/- .00(9)	50.0	50.0
12/07/82	11	49	50.0 +/- .00(10)	50.0	50.0
12/08/82	11	50	50.0 +/- .00(8)	50.0	50.0
12/09/82	11	51	50.0 +/- .00(9)	50.0	50.0
12/10/82	11	52	50.0 +/- .00(9)	50.0	50.0
WEEK SUMMARY			AV = 50.0 n = 5	50.0	50.0
12/13/82	12	53	51.8 +/- 2.98(8)	48.2	55.4
12/14/82	12	54	50.7 +/- 1.92(9)	47.8	53.0
12/15/82	12	55	50.8 +/- 2.67(7)	46.5	54.8
12/16/82	12	56	49.0 +/- 2.00(6)	46.7	51.4
12/17/82	12	57	53.4 +/- 2.84(6)	50.8	58.3
WEEK SUMMARY			AV = 51.1 n = 5	46.5	58.3
12/20/82	13	58	53.4 +/- 5.74(10)	46.2	63.6
12/21/82	13	59	51.0 +/- 3.26(10)	48.6	59.8
12/22/82	13	60	50.8 +/- 1.00(12)	49.4	52.3
12/23/82	13		HOLIDAY		
12/24/82	13		HOLIDAY		
WEEK SUMMARY			AV = 51.7 n = 3	46.2	63.6
12/27/82	14	61	51.7 +/- 1.33(11)	50.1	54.3
12/28/82	14	62	51.9 +/- 1.27(10)	50.0	54.0
12/29/82	14	63	54.7 +/- 1.34(12)	53.4	58.0
12/30/82	14	64	51.0 +/- .89(14)	49.9	53.4
12/31/82	14		HOLIDAY		
WEEK SUMMARY			AV = 52.3 n = 4	49.9	58.0
REPORT SUMMARY			AV = 51.0 n = 20	42.7	63.6



H - HOLIDAY M - OTHER O - OFF SCALE

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                    CHAMBER CONCENTRATIONS -- EDC/DS
                   74528:  ETHYLENE DICHLORIDE 50 PPM
                          WEEK 15 THRU 19
           EXPOSURE     EXPOSURE                                    MINIMUM      MAXIMUM
  DATE       WEEK          DAY        MEAN +/- S.D. (n)             READING      READING
---------  ---------    ---------    ---------------------          -------      -------
01/03/83      15            65        48.9  +/-   1.84(11)           45.4         51.6
01/04/83      15            66        51.6  +/-   1.30(13)           50.2         54.6
01/05/83      15            67        50.3  +/-   1.78(13)           49.1         56.0
01/06/83      15            68        49.1  +/-   1.15(14)           46.8         50.6
01/07/83      15            69        53.5  +/-    .94(14)           51.8         54.7
WEEK SUMMARY                     AV = 50.7          n =    5         45.4         56.0
------------------------------------------------------------------------------------------
01/10/83      16            70        51.1  +/-   1.05(14)           49.4         52.9
01/11/83      16            71        59.7  +/-   2.21(12)           55.5         61.2
01/12/83      16            72        56.7  +/-   2.68(11)           52.0         62.8
01/13/83      16            73        54.0  +/-   2.87(14)           47.9         57.5
01/14/83      16            74        50.0  +/-   3.06(13)           46.6         55.5
WEEK SUMMARY                     AV = 54.3          n =    5         46.6         62.8
------------------------------------------------------------------------------------------
01/17/83      17            75        47.6  +/-   2.87( 7)           44.7         52.8
01/18/83      17            76        51.9  +/-   2.02(12)           48.8         55.2
01/19/83      17            77        52.0  +/-    .73(14)           50.9         53.1
01/20/83      17            78        50.9  +/-    .68(14)           49.4         52.2
01/21/83      17            79        53.7  +/-   1.10(13)           52.1         56.0
WEEK SUMMARY                     AV = 51.2          n =    5         44.7         56.0
------------------------------------------------------------------------------------------
01/24/83      18            80        51.8  +/-    .56(12)           50.9         52.8
01/25/83      18            81        47.9  +/-   1.73(13)           44.6         50.2
01/26/83      18            82        50.1  +/-    .74(13)           49.3         52.1
01/27/83      18            83        54.1  +/-   1.10(13)           52.6         55.6
01/28/83      18            84        52.1  +/-   1.52(13)           50.0         55.0
WEEK SUMMARY                     AV = 51.2          n =    5         44.6         55.6
------------------------------------------------------------------------------------------
01/31/83      19            85        52.5  +/-   1.85(12)           50.9         57.5
WEEK SUMMARY                     AV = 52.5          n =    1         50.9         57.5
------------------------------------------------------------------------------------------
REPORT SUMMARY                   AV = 51.9          n =   21         44.6         62.8
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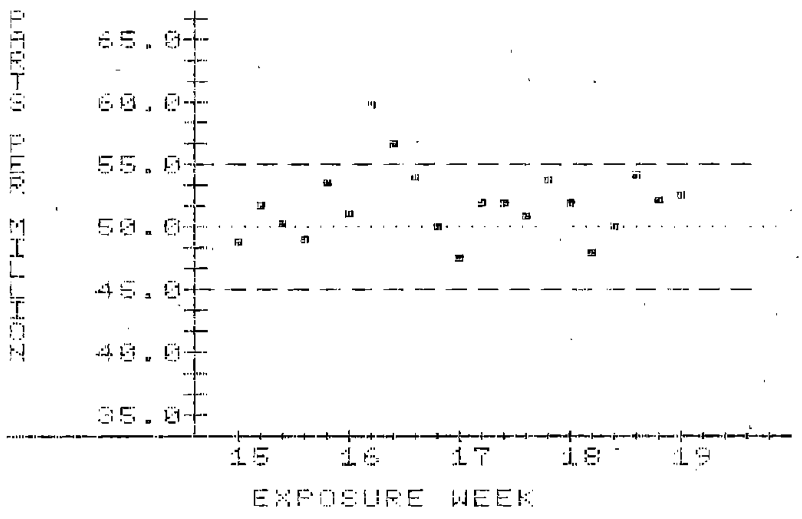
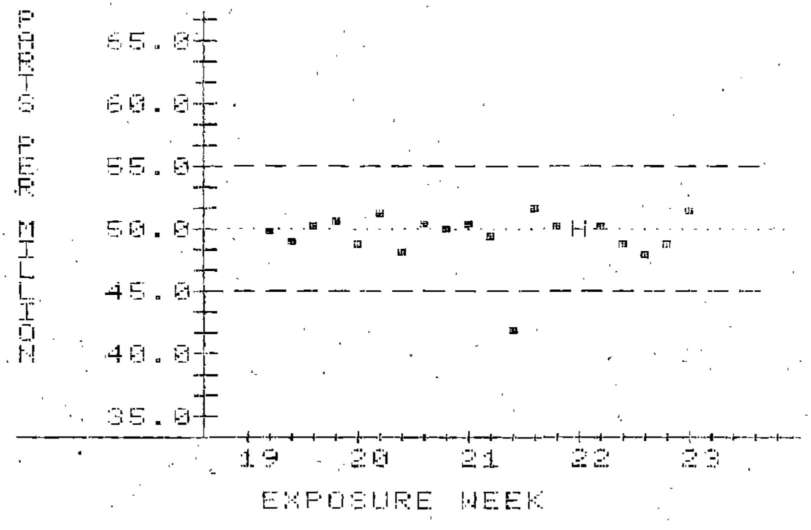


H - HOLIDAY   N - OTHER   O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/DS
7452B: ETHYLENE DICHLORIDE 50 PPM
WEEK 19 THRU 23

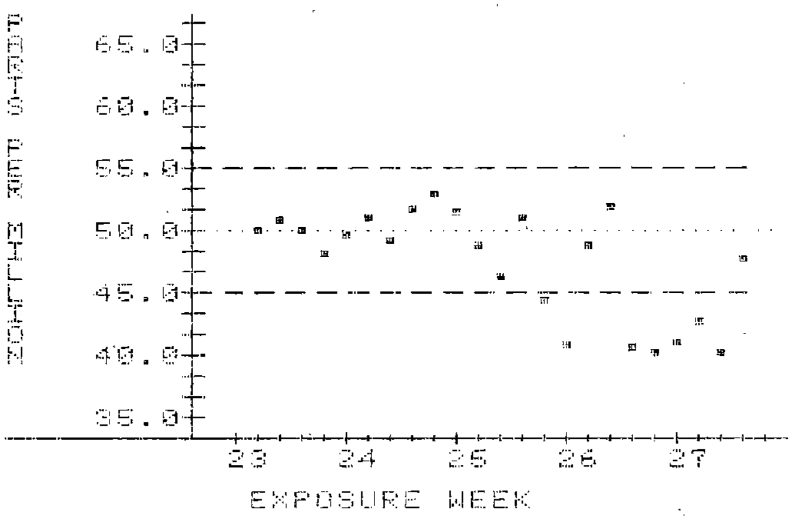
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
02/01/83	19	86	49.8 +/- .91(9)	48.9	51.6
02/02/83	19	87	49.1 +/- 1.17(14)	47.8	52.7
02/03/83	19	88	50.2 +/- 1.64(14)	46.9	54.3
02/04/83	19	89	50.7 +/- 1.04(14)	49.6	53.9
WEEK SUMMARY			AV = 50.0 n = 4	46.9	54.3
02/07/83	20	90	48.8 +/- 2.58(9)	44.1	51.3
02/08/83	20	91	51.2 +/- 1.51(11)	48.3	54.8
02/09/83	20	92	48.2 +/- 1.33(12)	46.1	50.1
02/10/83	20	93	50.4 +/- 1.88(14)	46.7	53.6
02/11/83	20	94	50.1 +/- 1.51(13)	47.6	52.3
WEEK SUMMARY			AV = 49.7 n = 5	44.1	54.8
02/14/83	21	95	50.5 +/- 2.07(13)	48.6	55.4
02/15/83	21	96	49.5 +/- 1.13(14)	47.2	51.2
02/16/83	21	97	42.0 +/- 1.76(11)	40.9	45.7
02/17/83	21	98	51.6 +/- 2.06(13)	47.4	54.9
02/18/83	21	99	50.3 +/- 1.47(14)	48.1	53.9
WEEK SUMMARY			AV = 48.8 n = 5	40.9	55.4
02/21/83	22		HOLIDAY		
02/22/83	22	100	50.3 +/- 1.05(13)	48.8	52.1
02/23/83	22	101	48.8 +/- 2.03(13)	44.0	50.7
02/24/83	22	102	48.0 +/- 2.17(12)	44.5	51.6
02/25/83	22	103	48.9 +/- 1.30(14)	47.2	50.8
WEEK SUMMARY			AV = 49.0 n = 4	44.0	52.1
02/28/83	23	104	51.4 +/- 3.28(12)	46.9	56.1
WEEK SUMMARY			AV = 51.4 n = 1	46.9	56.1
REPORT SUMMARY			AV = 49.5 n = 19	40.9	56.1



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/DS
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 23 THRU 27

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
03/01/83	23	105	50.0 +/- 2.79(11)	45.1	53.4
03/02/83	23	106	50.8 +/- 2.04(12)	48.3	54.7
03/03/83	23	107	50.0 +/- 1.81(13)	47.6	54.8
03/04/83	23	108	48.2 +/- 1.88(12)	45.5	50.5
WEEK SUMMARY			AV = 49.8 n = 4	45.1	54.8
03/07/83	24	109	49.6 +/- 1.44(11)	46.5	52.0
03/08/83	24	110	51.0 +/- 1.76(12)	45.6	52.3
03/09/83	24	111	49.2 +/- 2.16(13)	44.5	53.5
03/10/83	24	112	51.7 +/- 3.14(12)	46.6	55.6
03/11/83	24	113	53.0 +/- 1.92(11)	51.5	58.5
WEEK SUMMARY			AV = 50.9 n = 5	44.5	58.5
03/14/83	25	114	51.5 +/- 1.92(9)	47.3	53.6
03/15/83	25	115	48.9 +/- 1.51(12)	46.7	51.7
03/16/83	25	116	46.4 +/- 2.06(11)	43.5	48.8
03/17/83	25	117	51.0 +/- 2.25(14)	47.8	55.0
03/18/83	25	118	44.4 +/- 1.91(12)	42.7	49.7
WEEK SUMMARY			AV = 48.4 n = 5	42.7	55.0
03/21/83	26	119	41.0 +/- 2.20(11)	38.5	45.0
03/22/83	26	120	48.8 +/- 5.56(7)	38.6	55.6
03/23/83	26	121	51.9 +/- 1.61(13)	49.6	54.7
03/24/83	26	122	40.7 +/- 1.30(13)	38.7	43.6
03/25/83	26	123	40.3 +/- 1.73(13)	37.3	43.0
WEEK SUMMARY			AV = 44.5 n = 5	37.3	55.6
03/28/83	27	124	41.1 +/- .88(12)	39.9	42.8
03/29/83	27	125	42.9 +/- 1.67(13)	40.0	46.7
03/30/83	27	126	40.3 +/- 1.28(12)	38.6	43.1
03/31/83	27	127	47.7 +/- 2.85(12)	41.9	51.4
WEEK SUMMARY			AV = 43.0 n = 4	38.6	51.4
REPORT SUMMARY			AV = 47.4 n = 23	37.3	58.5



H - HOLIDAY N - OTHER O - OFF SCALE

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                         CHAMBER CONCENTRATIONS -- 10C/75
                         74528:  ETHYLENE DICHLORIDE 50 PPM
                                  WEEK 27 THRU 31
           EXPOSURE    EXPOSURE                                        MINIMUM    MAXIMUM
  DATE       WEEK         DAY         MEAN +/- S.D. (N)                READING    READING
--------   --------    --------     ----------------------             -------    -------
04/01/83      27          128         41.7  +/-   2.22( 3)              39.6       43.3
WEEK SUMMARY                    AV =  41.7          n =    1            39.6       43.3
------------------------------------------------------------------------------------------
04/04/83      28          129         52.4  +/-   3.35(12)              48.7       56.4
04/05/83      28          130         50.1  +/-   2.73(12)              45.1       56.1
04/06/83      28          131         49.4  +/-   2.33(12)              45.1       51.6
04/07/83      28          132         50.3  +/-   2.37(12)              48.4       53.0
04/08/83      28          133         49.7  +/-   2.05(12)              44.4       51.7
WEEK SUMMARY                    AV =  50.4          n =    5            44.4       56.4
------------------------------------------------------------------------------------------
04/11/83      29          134         53.0  +/-   1.33( 8)              50.9       54.6
04/12/83      29          135         50.8  +/-    .89(12)              48.9       52.4
04/13/83      29          136         51.5  +/-   2.07(12)              47.9       56.4
04/14/83      29          137         51.0  +/-   2.62(12)              46.2       54.3
04/15/83      29          138         51.4  +/-   3.21(12)              47.3       59.0
WEEK SUMMARY                    AV =  51.5          n =    5            45.2       59.0
------------------------------------------------------------------------------------------
04/18/83      30          139         50.4  +/-   1.69(13)              47.9       54.9
04/19/83      30          140         52.4  +/-   3.15(20)              46.8       58.0
04/20/83      30          141         49.5  +/-   1.64(12)              47.2       53.2
04/21/83      30          142         51.7  +/-   2.04(12)              48.0       56.0
04/22/83      30          143         49.9  +/-   1.29(12)              46.1       52.4
WEEK SUMMARY                    AV =  50.8          n =    5            46.1       58.0
------------------------------------------------------------------------------------------
04/25/83      31          144         50.6  +/-   1.17(11)              48.3       52.7
04/26/83      31          145         49.7  +/-   1.86(11)              47.1       53.2
04/27/83      31          146         49.5  +/-   2.55(12)              46.6       55.8
04/28/83      31          147         50.5  +/-   3.10(12)              47.4       56.5
04/29/83      31          148         51.8  +/-   1.29(12)              49.0       54.4
WEEK SUMMARY                    AV =  50.7          n =    5            46.6       56.5
------------------------------------------------------------------------------------------
REPORT SUMMARY                  AV =  50.4          n =   21            39.6       59.4
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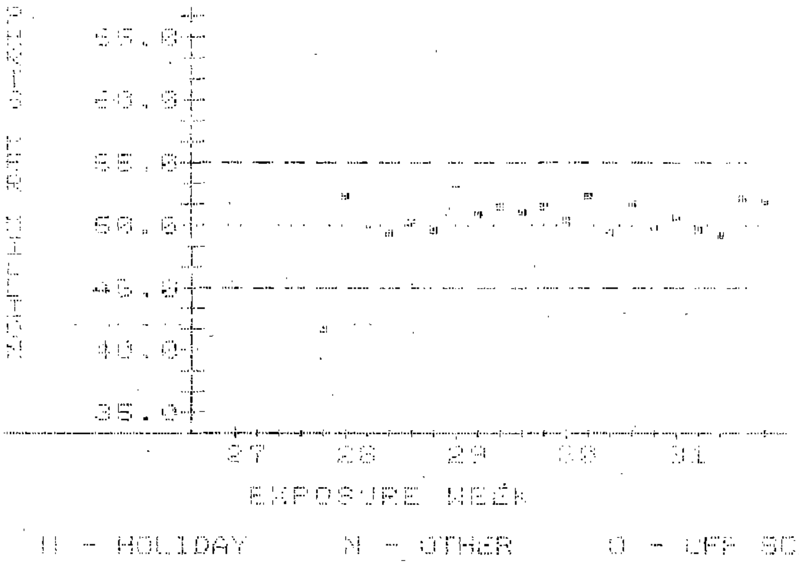
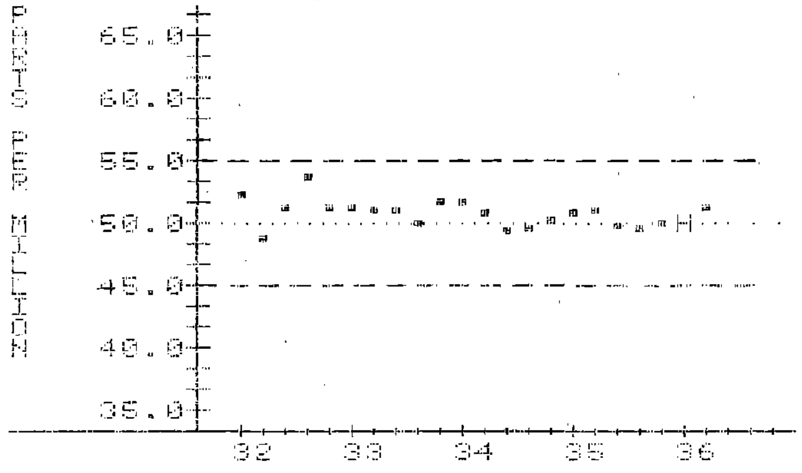


H - HOLIDAY   N - OTHER   O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/DS
7452B: ETHYLENE DICHLORIDE 50 PPM
WEEK 32 THRU 36

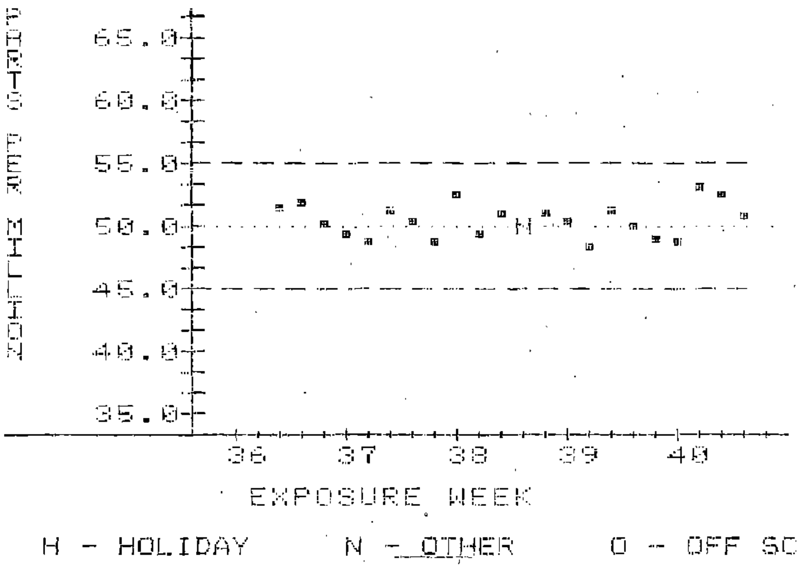
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
05/02/83	32	149	52.3 +/- 1.42(13)	50.1	55.9
05/03/83	32	150	48.9 +/- .94(14)	47.6	50.3
05/04/83	32	151	51.2 +/- 1.51(12)	49.2	54.5
05/05/83	32	152	53.7 +/- 3.76(11)	47.6	59.3
05/06/83	32	153	51.2 +/- 1.21(13)	50.0	54.5
WEEK SUMMARY			AV = 51.5 n = 5	47.6	59.3
05/09/83	33	154	51.3 +/- 1.55(12)	49.0	54.4
05/10/83	33	155	51.0 +/- 1.58(12)	49.6	55.6
05/11/83	33	156	51.1 +/- 1.25(12)	48.3	52.8
05/12/83	33	157	50.1 +/- 1.26(12)	47.9	51.6
05/13/83	33	158	51.6 +/- 1.60(13)	49.8	55.7
WEEK SUMMARY			AV = 51.0 n = 5	47.9	55.7
05/16/83	34	159	51.6 +/- 3.18(11)	46.0	56.9
05/17/83	34	160	50.8 +/- 1.07(12)	48.8	52.5
05/18/83	34	161	49.5 +/- .77(11)	47.9	50.3
05/19/83	34	162	49.7 +/- 1.13(12)	47.6	51.1
05/20/83	34	163	50.2 +/- 2.00(11)	47.2	54.8
WEEK SUMMARY			AV = 50.4 n = 5	46.0	56.9
05/23/83	35	164	50.9 +/- 1.68(13)	47.3	53.3
05/24/83	35	165	51.0 +/- 1.33(11)	48.3	53.2
05/25/83	35	166	49.8 +/- .78(12)	48.8	51.7
05/26/83	35	167	49.7 +/- 1.30(12)	46.7	51.1
05/27/83	35	168	50.0 +/- 1.22(13)	48.1	52.0
WEEK SUMMARY			AV = 50.3 n = 5	46.7	53.3
05/30/83	36		HOLIDAY		
05/31/83	36	169	51.2 +/- 1.27(13)	49.3	54.1
WEEK SUMMARY			AV = 51.2 n = 1	49.3	54.1
REPORT SUMMARY			AV = 50.8 n = 21	46.0	59.3



H - HOLIDAY N - OTHER O - OFF SCALE

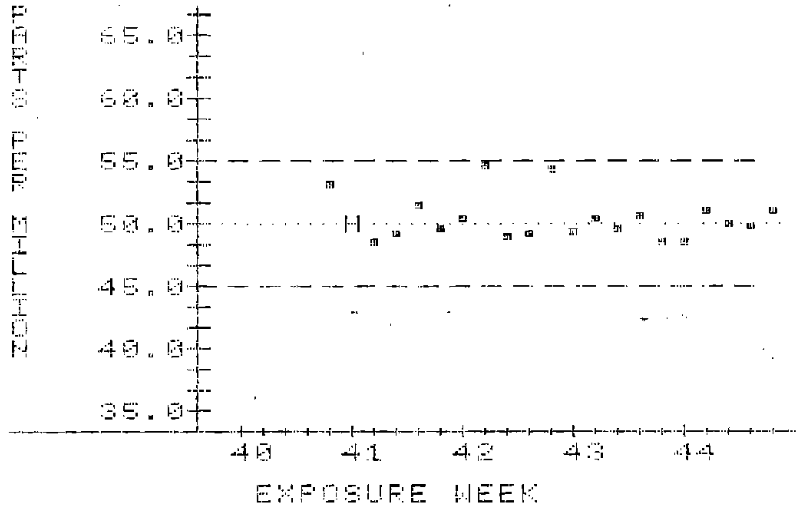
CHAMBER CONCENTRATIONS -- EDC/DS
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 36 THRU 40

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READINGS	MAXIMUM READING
06/01/83	36	170	51.5 +/- 1.64(14)	49.1	55.4
06/02/83	36	171	51.8 +/- 1.98(13)	46.8	54.1
06/03/83	36	172	50.2 +/- 1.20(11)	47.7	51.7
WEEK SUMMARY			AV = 51.2 n = 3	46.8	55.4
06/06/83	37	173	49.4 +/- .91(12)	47.5	50.7
06/07/83	37	174	48.9 +/- 1.00(11)	47.3	50.2
06/08/83	37	175	51.2 +/- 2.61(13)	45.6	54.6
06/09/83	37	176	50.5 +/- 2.21(13)	45.8	54.1
06/10/83	37	177	48.8 +/- 1.35(13)	46.6	50.5
WEEK SUMMARY			AV = 49.8 n = 5	45.6	54.6
06/13/83	38	178	52.6 +/- 2.16(14)	49.8	56.3
06/14/83	38	179	49.5 +/- 1.13(13)	47.9	52.0
06/15/83	38	180	51.1 +/- 1.79(13)	48.5	54.2
06/16/83	38		NON-EXPOSURE		
06/17/83	38	181	51.1 +/- .84(13)	49.5	52.8
WEEK SUMMARY			AV = 51.1 n = 4	47.9	56.3
06/20/83	39	182	50.5 +/- 2.58(12)	45.0	53.0
06/21/83	39	183	48.3 +/- 1.67(14)	46.6	52.6
06/22/83	39	184	51.2 +/- 1.65(13)	49.0	55.6
06/23/83	39	185	50.0 +/- 1.89(13)	46.7	52.2
06/24/83	39	186	49.1 +/- 1.63(13)	46.1	52.3
WEEK SUMMARY			AV = 49.8 n = 5	45.0	55.6
06/27/83	40	187	48.7 +/- 1.66(13)	46.6	51.1
06/28/83	40	188	53.1 +/- 1.41(13)	50.1	55.1
06/29/83	40	189	52.5 +/- 1.05(12)	50.3	54.1
06/30/83	40	190	50.8 +/- 2.44(13)	44.5	54.5
WEEK SUMMARY			AV = 51.3 n = 4	44.5	55.1
REPORT SUMMARY			AV = 50.5 n = 21	44.5	56.3



CHAMBER CONCENTRATIONS --- EDC/DS
7452B: ETHYLENE DICHLORIDE 50 PPM
WEEK 40 THRU 44

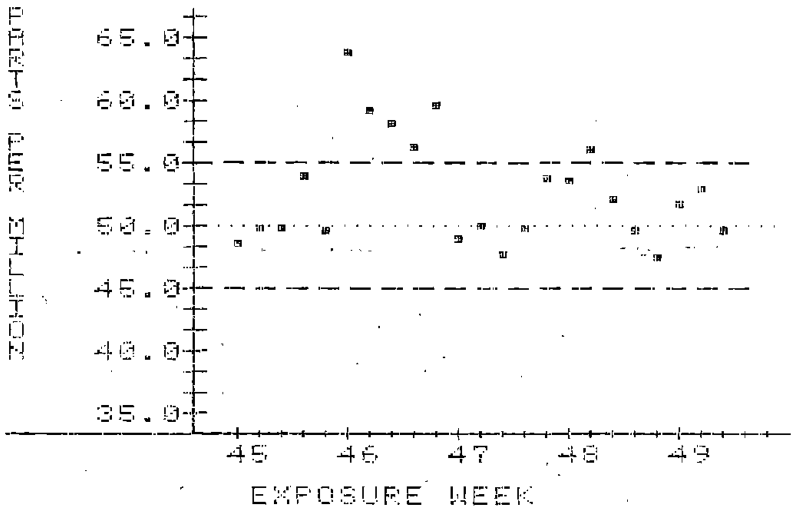
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (a)		MINIMUM READING	MAXIMUM READING
07/01/83	40	191	53.1 +/-	1.73(10)	51.1	57.2
WEEK SUMMARY			AV = 53.1	n = 1	51.1	57.2
07/04/83	41		HOLIDAY			
07/05/83	41	192	48.5 +/-	1.41(11)	46.1	50.2
07/06/83	41	193	49.2 +/-	1.60(12)	47.1	51.4
07/07/83	41	194	51.4 +/-	1.59(13)	49.3	55.0
07/08/83	41	195	49.7 +/-	1.17(12)	47.4	51.3
WEEK SUMMARY			AV = 49.7	n = 4	46.1	55.0
07/11/83	42	196	50.5 +/-	2.12(14)	47.0	53.9
07/12/83	42	197	54.6 +/-	1.28(14)	52.2	56.8
07/13/83	42	198	49.0 +/-	1.04(14)	47.1	51.0
07/14/83	42	199	49.3 +/-	1.43(14)	46.4	50.9
07/15/83	42	200	54.4 +/-	1.84(14)	50.1	56.5
WEEK SUMMARY			AV = 51.6	n = 5	46.4	56.8
07/18/83	43	201	49.4 +/-	2.32(12)	44.4	51.6
07/19/83	43	202	50.4 +/-	2.09(13)	47.1	55.1
07/20/83	43	203	49.6 +/-	1.93(14)	46.9	55.0
07/21/83	43	204	50.6 +/-	2.20(14)	47.1	55.7
07/22/83	43	205	48.6 +/-	1.24(13)	46.2	50.4
WEEK SUMMARY			AV = 49.7	n = 5	44.4	55.7
07/25/83	44	206	48.6 +/-	1.66(14)	44.6	51.5
07/26/83	44	207	51.1 +/-	1.90(14)	48.0	53.5
07/27/83	44	208	50.1 +/-	1.43(14)	47.1	52.4
07/28/83	44	209	49.9 +/-	1.93(15)	46.9	53.1
07/29/83	44	210	51.0 +/-	1.44(14)	47.7	53.4
WEEK SUMMARY			AV = 50.1	n = 5	44.6	53.5
REPORT SUMMARY			AV = 50.5	n = 20	44.4	57.2



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/DS
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 45 THRU 49

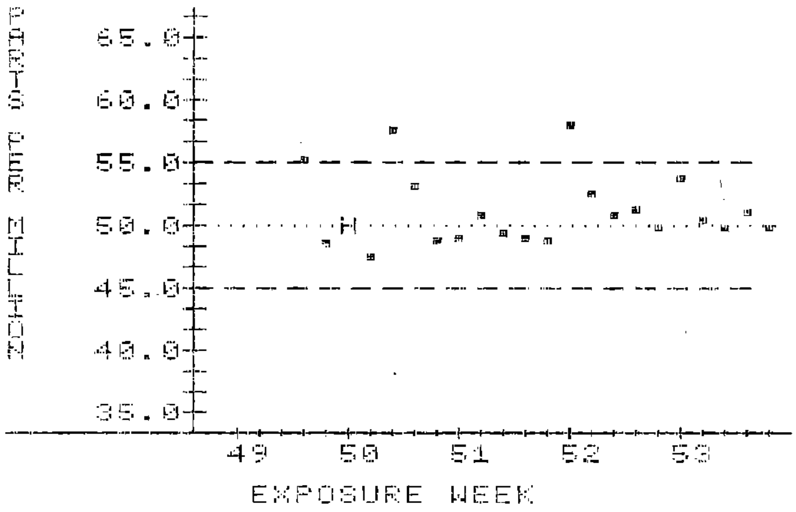
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
08/01/83	45	211	48.6 +/- 1.94(12)	45.2	52.4
08/02/83	45	212	49.9 +/- 1.90(14)	46.8	54.5
08/03/83	45	213	49.8 +/- 1.32(14)	48.1	53.8
08/04/83	45	214	54.0 +/- 1.06(15)	51.9	56.2
08/05/83	45	215	49.6 +/- 1.24(13)	46.4	50.8
WEEK SUMMARY			AV = 50.4 n = 5	45.2	56.2
08/08/83	46	216	63.6 +/- 1.64(14)	59.8	66.0
08/09/83	46	217	59.2 +/- 2.03(14)	54.7	61.7
08/10/83	46	218	58.0 +/- 1.60(14)	55.4	61.4
08/11/83	46	219	56.2 +/- 1.60(14)	53.1	58.1
08/12/83	46	220	59.6 +/- 1.23(14)	57.7	62.0
WEEK SUMMARY			AV = 59.3 n = 5	53.1	66.0
08/15/83	47	221	49.1 +/- 2.38(14)	46.1	52.4
08/16/83	47	222	50.0 +/- 1.38(14)	46.9	51.6
08/17/83	47	223	47.8 +/- 1.60(13)	46.3	52.4
08/18/83	47	224	49.9 +/- 1.91(14)	46.1	53.3
08/19/83	47	225	53.8 +/- 1.78(14)	51.6	58.9
WEEK SUMMARY			AV = 50.1 n = 5	46.1	58.9
08/22/83	48	226	53.5 +/- 1.62(14)	50.5	56.5
08/23/83	48	227	56.1 +/- 1.73(14)	54.3	60.3
08/24/83	48	228	52.2 +/- 1.47(14)	50.4	55.7
08/25/83	48	229	49.7 +/- 2.10(12)	46.2	53.5
08/26/83	48	230	47.6 +/- .79(14)	46.0	49.1
WEEK SUMMARY			AV = 51.8 n = 5	46.0	60.3
08/29/83	49	231	51.7 +/- 1.36(12)	48.8	53.4
08/30/83	49	232	53.0 +/- 2.18(13)	49.2	56.5
08/31/83	49	233	49.7 +/- 1.65(14)	45.4	52.5
WEEK SUMMARY			AV = 51.5 n = 3	45.4	56.5
REPORT SUMMARY			AV = 52.7 n = 23	45.2	66.0



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/DS
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 49 THRU 53

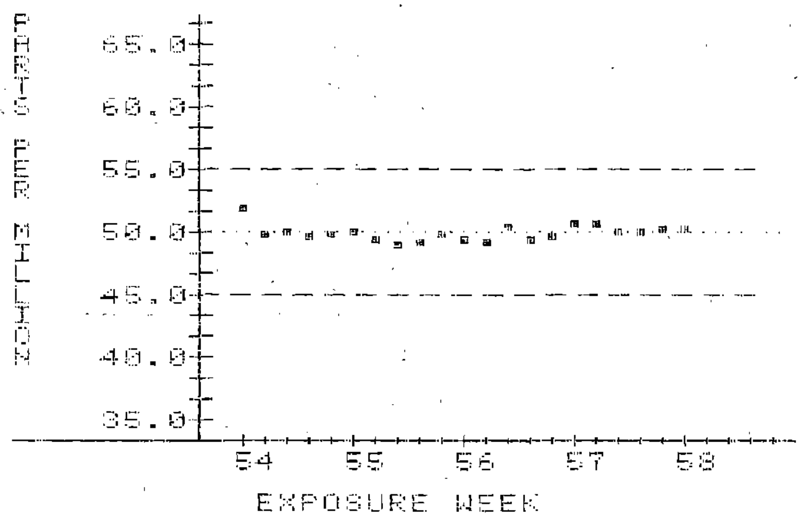
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)			MINIMUM READING	MAXIMUM READING
09/01/83	49	234	55.3	+/-	3.45(14)	47.3	58.9
09/02/83	49	235	48.6	+/-	1.99(13)	45.4	51.4
WEEK SUMMARY			AV = 52.0		n = 2	45.4	58.9
09/05/83	50		HOLIDAY				
09/06/83	50	236	47.5	+/-	3.04(14)	42.1	51.7
09/07/83	50	237	57.4	+/-	.53(12)	56.3	58.0
09/08/83	50	238	53.2	+/-	1.81(15)	49.4	55.8
09/09/83	50	239	48.7	+/-	2.37(6)	44.8	51.0
WEEK SUMMARY			AV = 51.7		n = 4	42.1	58.0
09/12/83	51	240	49.0	+/-	2.00(8)	46.1	52.0
09/13/83	51	241	50.9	+/-	1.78(8)	48.4	53.2
09/14/83	51	242	49.4	+/-	1.90(9)	47.4	52.1
09/15/83	51	243	49.1	+/-	1.38(9)	46.7	50.6
09/16/83	51	244	48.8	+/-	2.34(8)	45.1	52.6
WEEK SUMMARY			AV = 49.4		n = 5	45.1	53.2
09/19/83	52	245	57.9	+/-	.78(10)	56.6	59.2
09/20/83	52	246	52.6	+/-	.93(12)	50.7	53.8
09/21/83	52	247	50.8	+/-	1.02(11)	48.9	51.9
09/22/83	52	248	51.2	+/-	.90(14)	50.1	53.4
09/23/83	52	249	49.9	+/-	1.22(14)	47.3	51.3
WEEK SUMMARY			AV = 52.5		n = 5	47.3	59.2
09/26/83	53	250	53.8	+/-	1.36(14)	51.5	56.8
09/27/83	53	251	50.5	+/-	1.66(14)	48.8	53.3
09/28/83	53	252	49.8	+/-	1.38(13)	46.4	51.0
09/29/83	53	253	51.1	+/-	.94(13)	49.0	52.4
09/30/83	53	254	49.8	+/-	.34(9)	49.3	50.3
WEEK SUMMARY			AV = 51.0		n = 5	46.4	56.8
REPORT SUMMARY			AV = 51.2		n = 21	42.1	59.2



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/DS
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 54 THRU 58

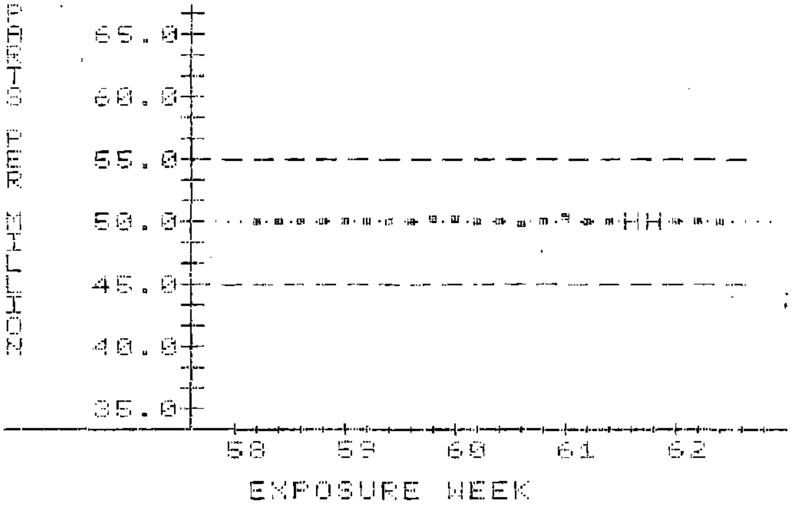
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
10/03/83	54	255	51.8 +/- 1.31(12)	49.9	53.7
10/04/83	54	256	49.9 +/- .98(13)	47.8	51.0
10/05/83	54	257	50.0 +/- 1.76(12)	45.5	51.7
10/06/83	54	258	49.7 +/- 1.96(13)	45.0	51.4
10/07/83	54	259	49.8 +/- .67(13)	48.8	51.0
WEEK SUMMARY			AV = 50.2 n = 5	45.0	53.7
10/10/83	55	260	50.0 +/- 1.76(12)	45.6	52.0
10/11/83	55	261	49.5 +/- 1.92(13)	47.1	54.1
10/12/83	55	262	49.0 +/- 1.28(13)	47.1	51.3
10/13/83	55	263	49.2 +/- 1.96(13)	45.4	52.2
10/14/83	55	264	49.9 +/- 1.07(13)	47.5	51.3
WEEK SUMMARY			AV = 49.5 n = 5	45.4	54.1
10/17/83	56	265	49.5 +/- 1.08(13)	48.0	51.8
10/18/83	56	266	49.3 +/- 1.46(13)	46.8	51.8
10/19/83	56	267	50.5 +/- .80(13)	49.5	52.1
10/20/83	56	268	49.4 +/- .61(14)	48.4	50.5
10/21/83	56	269	49.7 +/- .54(13)	48.7	50.5
WEEK SUMMARY			AV = 49.7 n = 5	46.8	52.1
10/24/83	57	270	50.6 +/- .94(11)	48.7	52.0
10/25/83	57	271	50.7 +/- .52(13)	50.0	51.5
10/26/83	57	272	50.0 +/- 1.24(13)	46.4	51.2
10/27/83	57	273	50.1 +/- .59(13)	48.7	51.0
10/28/83	57	274	50.2 +/- .64(13)	49.5	51.7
WEEK SUMMARY			AV = 50.3 n = 5	46.4	52.0
10/31/83	58	275	50.2 +/- .86(13)	48.9	51.9
WEEK SUMMARY			AV = 50.2 n = 1	48.9	51.9
REPORT SUMMARY			AV = 50.0 n = 21	45.0	54.1



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/DS
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 58 THRU 62

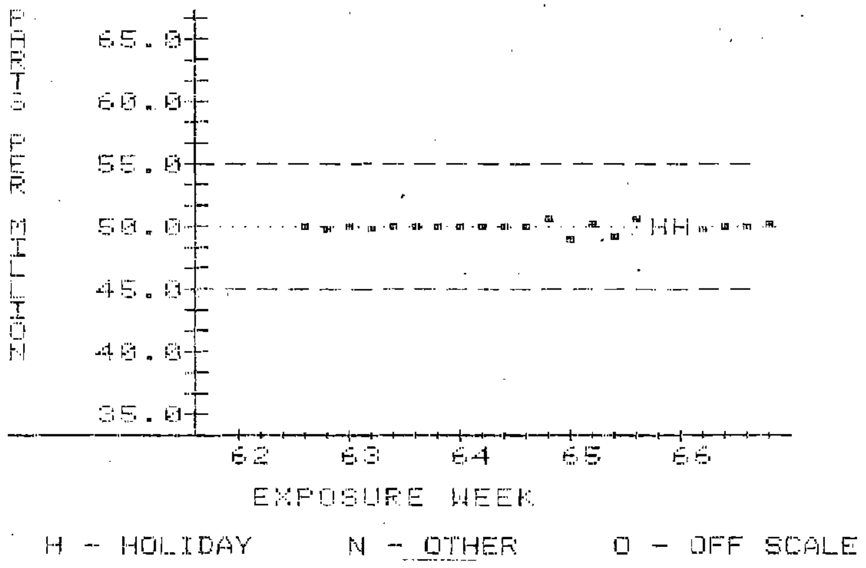
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
11/01/83	58	276	50.1 +/- .99(13)	49.1	52.5
11/02/83	58	277	50.0 +/- .97(13)	49.0	52.8
11/03/83	58	278	50.0 +/- .88(13)	48.9	51.9
11/04/83	58	279	50.1 +/- .98(13)	47.3	50.9
WEEK SUMMARY			AV = 50.1 n = 4	47.3	52.8
11/07/83	59	280	50.0 +/- 1.83(13)	45.0	51.9
11/08/83	59	281	50.0 +/- .57(13)	49.1	51.1
11/09/83	59	282	50.1 +/- 1.58(13)	48.5	54.7
11/10/83	59	283	50.1 +/- 2.29(13)	47.0	55.3
11/11/83	59	284	50.2 +/- .95(13)	49.1	52.3
WEEK SUMMARY			AV = 50.1 n = 5	45.0	55.3
11/14/83	60	285	50.2 +/- 1.03(13)	48.6	51.8
11/15/83	60	286	50.0 +/- 1.70(12)	47.0	54.6
11/16/83	60	287	50.1 +/- 1.67(12)	47.7	52.5
11/17/83	60	288	49.9 +/- 1.56(13)	46.4	52.1
11/18/83	60	289	50.0 +/- 1.10(12)	48.3	52.0
WEEK SUMMARY			AV = 50.0 n = 5	46.4	54.6
11/21/83	61	290	50.5 +/- 2.07(11)	47.0	54.5
11/22/83	61	291	50.0 +/- 1.19(13)	48.0	52.2
11/23/83	61	292	50.1 +/- 1.00(14)	48.2	51.3
11/24/83	61		HOLIDAY		
11/25/83	61		HOLIDAY		
WEEK SUMMARY			AV = 50.2 n = 3	47.0	54.5
11/28/83	62	293	50.1 +/- 1.48(14)	45.8	52.0
11/29/83	62	294	50.1 +/- 1.07(14)	47.8	51.9
11/30/83	62	295	50.0 +/- 1.09(14)	47.5	52.0
WEEK SUMMARY			AV = 50.1 n = 3	45.8	52.0
REPORT SUMMARY			AV = 50.1 n = 20	45.0	55.3



H - HOLIDAY N - OTHER O - OFF SCALE

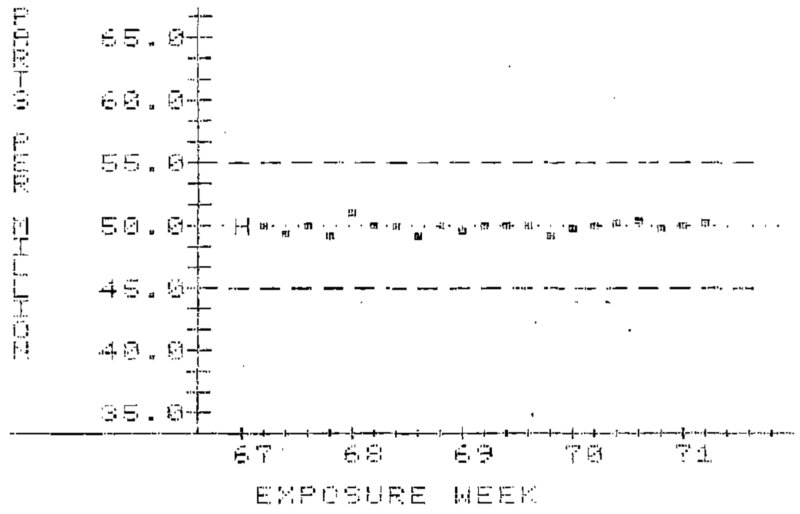
CHAMBER CONCENTRATIONS --- EDC/OS
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 62 THRU 66

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
12/01/83	62	296	50.1 +/- 1.00(14)	48.6	51.7
12/02/83	62	297	49.9 +/- 1.50(14)	47.3	53.0
WEEK SUMMARY			AV = 50.0 n = 2	47.3	53.0
12/05/83	63	298	50.0 +/- 1.29(14)	47.1	51.5
12/06/83	63	299	49.9 +/- .88(14)	48.7	51.4
12/07/83	63	300	50.0 +/- 1.11(14)	48.2	51.8
12/08/83	63	301	50.0 +/- 1.71(13)	45.4	51.8
12/09/83	63	302	50.1 +/- 1.49(14)	46.9	51.9
WEEK SUMMARY			AV = 50.0 n = 5	45.4	51.9
12/12/83	64	303	50.1 +/- 1.22(14)	46.2	51.3
12/13/83	64	304	50.0 +/- .67(14)	49.2	51.6
12/14/83	64	305	50.0 +/- .99(14)	46.9	51.2
12/15/83	64	306	50.1 +/- .74(14)	49.1	51.5
12/16/83	64	307	50.6 +/- 1.97(12)	46.3	55.0
WEEK SUMMARY			AV = 50.2 n = 5	46.2	55.0
12/19/83	65	308	49.0 +/- 1.47(8)	47.1	52.3
12/20/83	65	309	50.3 +/- .63(13)	49.3	51.3
12/21/83	65	310	49.3 +/- .88(13)	48.3	52.0
12/22/83	65	311	50.7 +/- .62(13)	49.7	52.2
12/23/83	65		HOLIDAY		
WEEK SUMMARY			AV = 49.8 n = 4	47.1	52.3
12/26/83	66		HOLIDAY		
12/27/83	66	312	49.9 +/- 1.74(13)	47.6	54.0
12/28/83	66	313	50.1 +/- 1.20(10)	47.4	51.3
12/29/83	66	314	50.0 +/- 1.56(13)	45.6	51.8
12/30/83	66	315	50.3 +/- 1.45(13)	48.8	53.3
WEEK SUMMARY			AV = 50.1 n = 4	45.6	54.0
REPORT SUMMARY			AV = 50.0 n = 20	45.4	55.0



CHAMBER CONCENTRATIONS -- EDC/DS
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 67 THRU 71

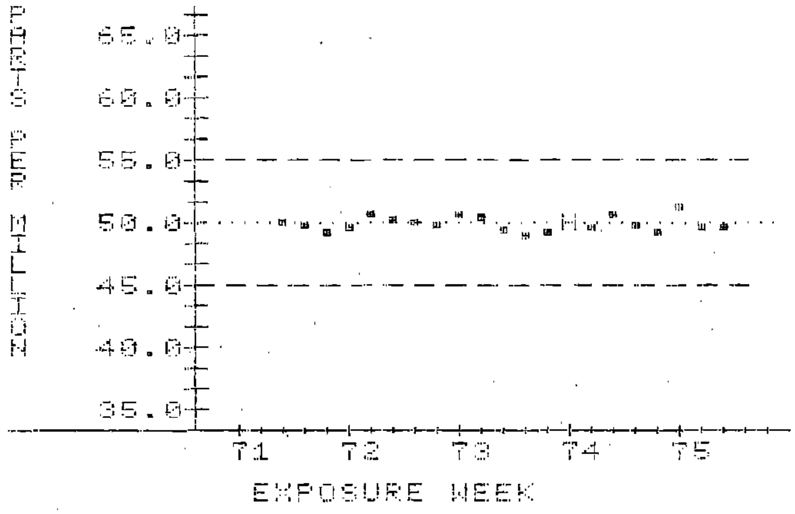
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)			MINIMUM READING	MAXIMUM READING
01/02/84	67		HOLIDAY				
01/03/84	67	316	50.1	+/-	1.76(14)	48.0	54.1
01/04/84	67	317	49.4	+/-	1.58(11)	46.6	51.7
01/05/84	67	318	50.1	+/-	1.37(14)	47.3	52.5
01/06/84	67	319	49.2	+/-	1.70(14)	46.9	52.2
WEEK SUMMARY			AV = 49.7		n = 4	46.6	54.1
01/09/84	68	320	51.1	+/-	5.60(14)	43.9	67.0
01/10/84	68	321	50.1	+/-	2.10(14)	45.7	52.7
01/11/84	68	322	50.1	+/-	1.56(14)	46.5	52.7
01/12/84	68	323	49.2	+/-	1.96(13)	45.8	52.7
01/13/84	68	324	50.1	+/-	.88(13)	48.0	51.3
WEEK SUMMARY			AV = 50.1		n = 5	43.9	67.0
01/16/84	69	325	49.6	+/-	1.32(14)	47.3	51.4
01/17/84	69	326	50.0	+/-	2.19(13)	45.8	51.8
01/18/84	69	327	50.1	+/-	.80(13)	48.5	51.7
01/19/84	69	328	50.0	+/-	1.31(16)	48.6	53.6
01/20/84	69	329	49.3	+/-	1.50(16)	45.1	51.0
WEEK SUMMARY			AV = 49.8		n = 5	45.1	53.6
01/23/84	70	330	49.8	+/-	.97(16)	48.2	51.5
01/24/84	70	331	50.0	+/-	1.10(16)	47.0	52.5
01/25/84	70	332	50.2	+/-	1.21(16)	46.4	51.4
01/26/84	70	333	50.5	+/-	2.07(11)	47.0	53.3
01/27/84	70	334	49.9	+/-	.67(15)	48.5	51.1
WEEK SUMMARY			AV = 50.1		n = 5	46.4	53.3
01/30/84	71	335	50.0	+/-	.99(12)	48.4	52.0
01/31/84	71	336	50.3	+/-	1.49(15)	45.9	51.7
WEEK SUMMARY			AV = 50.2		n = 2	45.9	52.0
REPORT SUMMARY			AV = 50.0		n = 21	43.9	67.0



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/DS
7452B: ETHYLENE DICHLORIDE 50 PPM
WEEK 71 THRU 75

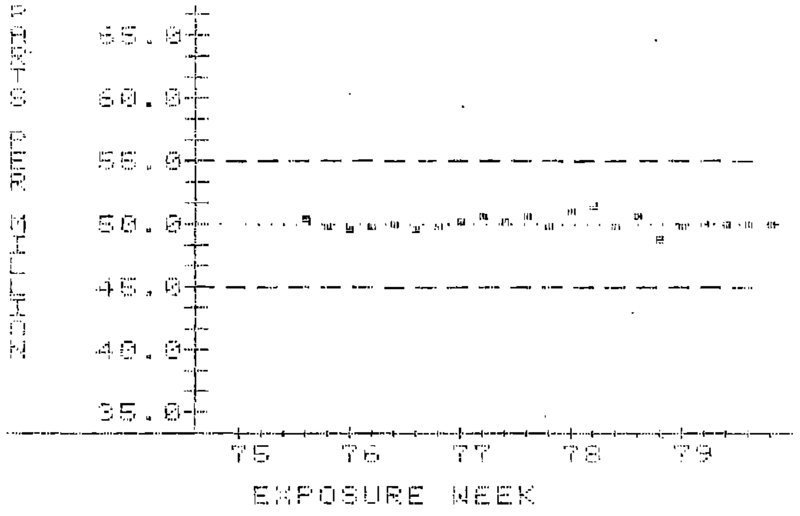
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)			MINIMUM READING	MAXIMUM READING
02/01/84	71	337	50.0	+/-	.54(9)	49.2	50.8
02/02/84	71	338	49.9	+/-	.75(16)	48.5	51.3
02/03/84	71	339	49.3	+/-	2.23(13)	42.4	51.7
WEEK SUMMARY			AV = 49.7		n = 3	42.4	51.7
02/06/84	72	340	49.7	+/-	1.28(14)	47.9	52.2
02/07/84	72	341	50.6	+/-	.94(13)	48.4	51.7
02/08/84	72	342	50.3	+/-	1.87(16)	45.7	55.4
02/09/84	72	343	50.0	+/-	.68(15)	49.2	51.6
02/10/84	72	344	49.9	+/-	1.31(15)	46.6	51.3
WEEK SUMMARY			AV = 50.1		n = 5	45.7	55.4
02/13/84	73	345	50.7	+/-	.77(15)	48.5	51.9
02/14/84	73	346	50.5	+/-	1.57(16)	46.5	52.5
02/15/84	73	347	49.5	+/-	1.27(14)	46.9	52.1
02/16/84	73	348	49.0	+/-	1.25(16)	45.0	50.0
02/17/84	73	349	49.2	+/-	1.10(16)	47.3	50.9
WEEK SUMMARY			AV = 49.8		n = 5	45.0	52.5
02/20/84	74		HOLIDAY				
02/21/84	74	350	49.7	+/-	1.00(15)	48.1	52.4
02/22/84	74	351	50.7	+/-	.85(15)	49.1	52.6
02/23/84	74	352	49.9	+/-	1.06(15)	46.5	50.9
02/24/84	74	353	49.3	+/-	.71(14)	47.7	50.4
WEEK SUMMARY			AV = 49.9		n = 4	46.5	52.6
02/27/84	75	354	51.3	+/-	1.38(15)	48.4	53.1
02/28/84	75	355	49.6	+/-	2.01(12)	45.0	51.7
02/29/84	75	356	49.7	+/-	1.57(13)	46.2	51.3
WEEK SUMMARY			AV = 50.2		n = 3	45.0	53.1
REPORT SUMMARY			AV = 49.9		n = 20	42.4	55.4



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS --- EDC/DS
7452B: ETHYLENE DICHLORIDE 50 PPM
WEEK 75 THRU 79

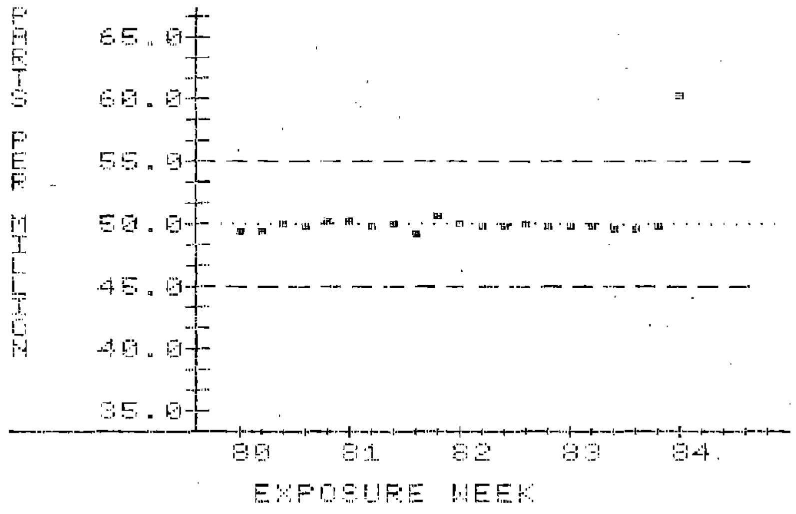
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
03/01/84	75	357	50.5 +/- 1.56(16)	48.7	53.4
03/02/84	75	358	49.8 +/- 2.16(16)	47.4	56.8
WEEK SUMMARY			AV = 50.2 n = 2	47.4	56.8
03/05/84	76	359	49.6 +/- 1.08(15)	46.2	51.0
03/06/84	76	360	49.8 +/- 1.52(15)	45.7	51.5
03/07/84	76	361	50.0 +/- 1.25(15)	46.1	51.9
03/08/84	76	362	49.6 +/- 1.80(15)	45.9	52.0
03/09/84	76	363	49.9 +/- 1.11(15)	47.4	51.8
WEEK SUMMARY			AV = 49.8 n = 5	45.7	52.0
03/12/84	77	364	50.2 +/- 1.46(14)	46.3	52.6
03/13/84	77	365	50.6 +/- .79(14)	48.4	51.7
03/14/84	77	366	50.3 +/- 1.01(15)	47.9	52.2
03/15/84	77	367	50.7 +/- 7.89(4)	45.3	62.4
03/16/84	77	368	49.9 +/- 1.83(14)	45.9	53.8
WEEK SUMMARY			AV = 50.3 n = 5	45.3	62.4
03/19/84	78	369	51.0 +/- 2.03(14)	46.6	55.3
03/20/84	78	370	51.5 +/- 3.40(14)	48.8	62.6
03/21/84	78	371	49.8 +/- 1.17(15)	46.3	51.0
03/22/84	78	372	50.6 +/- 1.27(15)	48.4	53.8
03/23/84	78	373	48.8 +/- 1.06(15)	46.2	51.1
WEEK SUMMARY			AV = 50.3 n = 5	46.2	62.6
03/26/84	79	374	49.9 +/- .96(12)	48.4	51.2
03/27/84	79	375	50.1 +/- .88(15)	48.7	51.3
03/28/84	79	376	50.0 +/- 1.39(15)	45.5	51.2
03/29/84	79	377	50.0 +/- .71(15)	48.7	51.2
03/30/84	79	378	50.0 +/- .84(14)	48.7	51.2
WEEK SUMMARY			AV = 50.0 n = 5	45.5	51.3
REPORT SUMMARY			AV = 50.1 n = 22	45.3	62.6



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/DS
7452B: ETHYLENE DICHLORIDE 50 PPM
WEEK 80 THRU 84

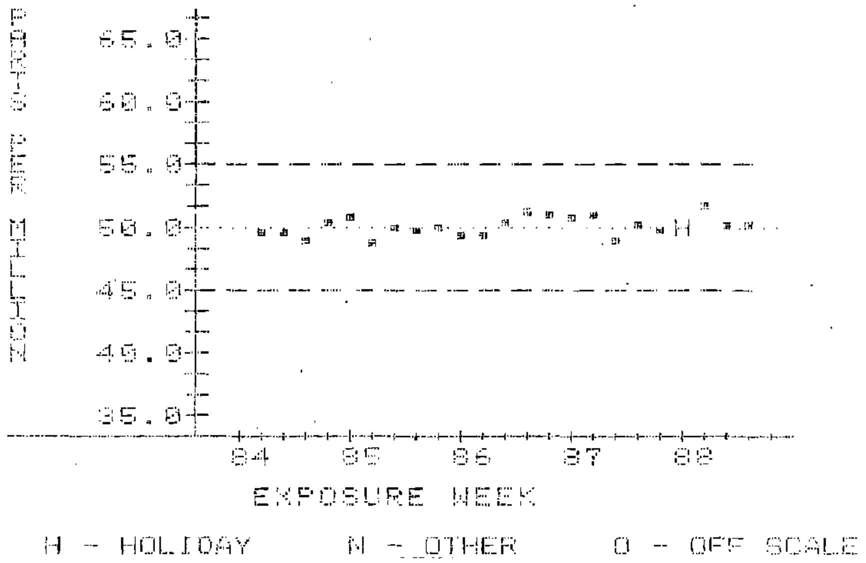
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
04/02/84	80	379	49.4 +/- 1.18(15)	47.3	51.2
04/03/84	80	380	49.5 +/- .75(14)	47.4	50.7
04/04/84	80	381	50.0 +/- .92(14)	48.8	52.0
04/05/84	80	382	49.9 +/- .87(14)	49.0	52.2
04/06/84	80	383	50.2 +/- .63(14)	49.4	51.7
WEEK SUMMARY			AV = 49.8 n = 5	47.3	52.2
04/09/84	81	384	50.2 +/- 1.13(15)	47.2	51.4
04/10/84	81	385	49.9 +/- .94(14)	47.0	51.2
04/11/84	81	386	50.1 +/- .97(14)	48.5	52.5
04/12/84	81	387	49.3 +/- 1.33(12)	46.1	51.8
04/13/84	81	388	50.6 +/- 1.07(14)	49.2	52.9
WEEK SUMMARY			AV = 50.0 n = 5	46.1	52.9
04/16/84	82	389	50.1 +/- 1.18(14)	47.2	52.1
04/17/84	82	390	49.9 +/- .81(14)	48.3	51.2
04/18/84	82	391	49.8 +/- 1.48(14)	47.1	51.7
04/19/84	82	392	50.1 +/- 1.12(14)	48.1	51.9
04/20/84	82	394	49.9 +/- .85(14)	47.4	50.9
WEEK SUMMARY			AV = 50.0 n = 5	47.1	52.1
04/23/84	83	395	49.8 +/- 1.10(14)	48.3	52.0
04/24/84	83	396	49.8 +/- 1.41(15)	45.6	52.4
04/25/84	83	397	49.7 +/- 1.42(14)	45.1	50.8
04/26/84	83	398	49.6 +/- 1.00(15)	47.4	51.9
04/27/84	83	399	49.8 +/- .45(13)	49.3	51.1
WEEK SUMMARY			AV = 49.7 n = 5	45.1	52.4
04/30/84	84	400	60.1 +/- .71(11)	58.2	61.0
WEEK SUMMARY			AV = 60.1 n = 1	58.2	61.0
REPORT SUMMARY			AV = 50.4 n = 21	45.1	61.0



H - HOLIDAY N - OTHER O - OFF SCALE

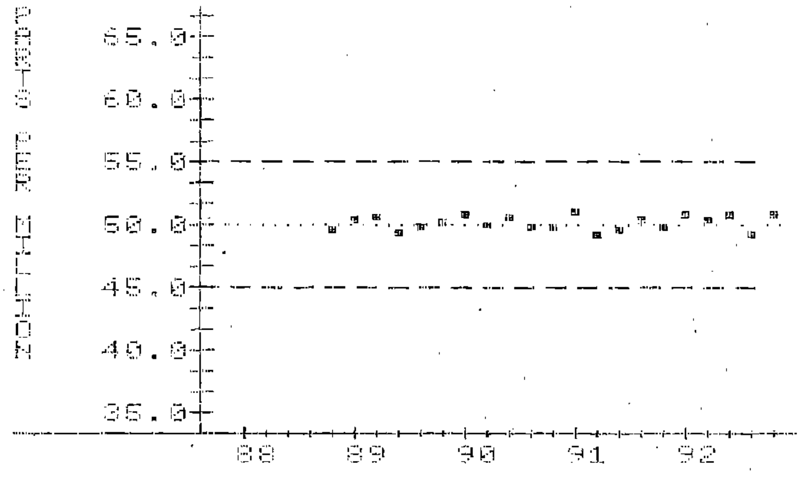
CHAMBER CONCENTRATIONS -- EDC/DS
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 84 THRU 88

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
05/01/84	84	400	49.7 +/- .90(16)	48.2	51.0
05/02/84	84	401	49.7 +/- .70(14)	48.8	51.4
05/03/84	84	402	49.1 +/- .84(14)	46.8	50.0
05/04/84	84	403	50.4 +/- 1.06(15)	47.9	52.6
WEEK SUMMARY			AV = 49.7 n = 4	46.8	52.6
05/07/84	85	404	50.8 +/- 1.57(14)	47.4	53.3
05/08/84	85	405	48.8 +/- 3.06(15)	40.7	51.9
05/09/84	85	406	50.1 +/- 1.62(12)	48.3	53.0
05/10/84	85	407	49.8 +/- 1.39(15)	46.8	52.0
05/11/84	85	408	50.0 +/- .96(15)	47.6	51.1
WEEK SUMMARY			AV = 49.9 n = 5	40.7	53.3
05/14/84	86	409	49.4 +/- 2.85(13)	46.1	56.9
05/15/84	86	410	49.5 +/- .94(14)	46.8	50.4
05/16/84	86	411	50.4 +/- .98(15)	47.2	51.2
05/17/84	86	412	51.3 +/- 1.80(15)	45.7	53.5
05/18/84	86	413	51.0 +/- .98(15)	47.0	52.7
WEEK SUMMARY			AV = 50.3 n = 5	45.7	56.9
05/21/84	87	414	50.8 +/- 1.25(14)	47.0	52.2
05/22/84	87	415	51.1 +/- 3.81(16)	43.7	59.8
05/23/84	87	416	49.0 +/- 1.57(14)	45.4	51.9
05/24/84	87	417	50.3 +/- 1.93(10)	45.7	52.4
05/25/84	87	418	49.9 +/- 1.29(14)	45.8	51.0
WEEK SUMMARY			AV = 50.2 n = 5	43.7	59.8
05/28/84	88		HOLIDAY		
05/29/84	88	419	51.6 +/- 4.80(15)	47.3	63.6
05/30/84	88	420	50.3 +/- 1.45(13)	46.8	51.8
05/31/84	88	421	50.3 +/- 1.57(14)	47.4	52.1
WEEK SUMMARY			AV = 50.7 n = 3	46.8	63.6
REPORT SUMMARY			AV = 50.2 n = 22	40.7	63.6



CHAMBER CONCENTRATIONS -- EDC/DS
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 88 THRU 92

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
06/01/84	88	422	49.7 +/- 1.30(15)	46.0	51.7
WEEK SUMMARY			AV = 49.7 n = 1	46.0	51.7
06/04/84	89	423	50.5 +/- 1.77(13)	45.6	52.4
06/05/84	89	424	50.7 +/- .96(15)	49.4	52.4
06/06/84	89	425	49.4 +/- .90(13)	47.3	51.1
06/07/84	89	426	49.9 +/- 1.02(13)	48.6	51.5
06/08/84	89	427	50.2 +/- .89(13)	49.1	52.7
WEEK SUMMARY			AV = 50.1 n = 5	45.6	52.7
06/11/84	90	428	50.8 +/- .93(15)	49.4	52.5
06/12/84	90	429	50.0 +/- 1.89(14)	48.3	54.3
06/13/84	90	430	50.6 +/- 1.20(14)	47.8	52.5
06/14/84	90	431	49.9 +/- 1.48(13)	45.6	51.6
06/15/84	90	432	49.9 +/- 2.26(15)	46.8	54.8
WEEK SUMMARY			AV = 50.2 n = 5	45.6	54.8
06/18/84	91	433	51.1 +/- 2.47(14)	47.1	54.9
06/19/84	91	434	49.2 +/- .91(14)	47.5	50.7
06/20/84	91	435	49.7 +/- 1.36(15)	46.0	52.1
06/21/84	91	436	50.5 +/- 1.57(15)	45.6	51.9
06/22/84	91	437	49.9 +/- 1.09(15)	47.5	51.6
WEEK SUMMARY			AV = 50.1 n = 5	45.6	54.9
06/25/84	92	438	50.9 +/- .72(13)	49.9	52.3
06/26/84	92	439	50.4 +/- 1.22(14)	46.6	51.5
06/27/84	92	440	50.8 +/- 1.34(15)	48.2	52.6
06/28/84	92	441	49.3 +/- .93(15)	47.3	51.1
06/29/84	92	442	50.9 +/- 1.61(14)	48.7	55.2
WEEK SUMMARY			AV = 50.5 n = 5	46.6	55.2
REPORT SUMMARY			AV = 50.2 n = 21	45.6	55.2

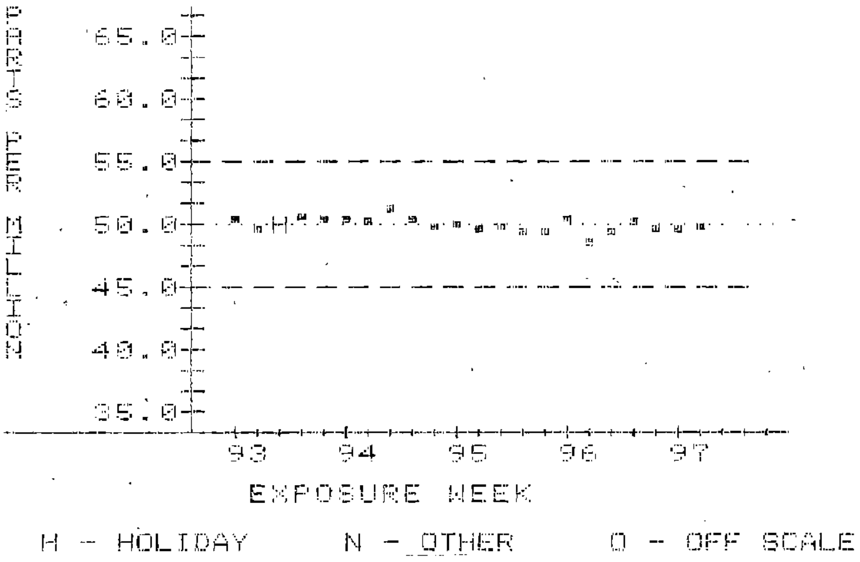


EXPOSURE WEEK

H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/DS
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 93 THRU 97

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
07/02/84	93	443	50.5 +/- 1.32(15)	47.0	52.1
07/03/84	93	444	49.6 +/- .86(14)	48.4	51.0
07/04/84	93		HOLIDAY		
07/05/84	93	445	50.7 +/- 1.72(15)	46.2	52.9
07/06/84	93	446	50.4 +/- 1.73(15)	45.6	52.2
WEEK SUMMARY			AV = 50.3 n = 4	45.6	52.9
07/09/84	94	447	50.4 +/- 2.07(13)	45.5	53.4
07/10/84	94	448	50.2 +/- 1.99(15)	45.8	54.9
07/11/84	94	449	51.3 +/- 2.82(15)	48.2	59.4
07/12/84	94	450	50.4 +/- 1.55(16)	45.1	52.0
07/13/84	94	451	49.8 +/- 1.60(15)	45.8	52.2
WEEK SUMMARY			AV = 50.4 n = 5	45.1	59.4
07/16/84	95	452	50.0 +/- .95(15)	48.3	51.9
07/17/84	95	453	49.7 +/- 1.77(15)	47.4	53.4
07/18/84	95	454	49.8 +/- 1.08(14)	48.4	51.6
07/19/84	95	455	49.4 +/- 1.50(15)	45.3	51.4
07/20/84	95	456	49.4 +/- 1.39(15)	47.0	51.1
WEEK SUMMARY			AV = 49.7 n = 5	45.3	53.4
07/23/84	96	457	50.5 +/- 1.22(16)	48.0	52.7
07/24/84	96	458	48.6 +/- 1.17(14)	45.7	50.6
07/25/84	96	459	49.5 +/- 1.26(14)	46.3	50.9
07/26/84	96	460	50.2 +/- .97(15)	47.6	51.1
07/27/84	96	461	49.6 +/- .72(15)	48.8	51.8
WEEK SUMMARY			AV = 49.7 n = 5	45.7	52.7
07/30/84	97	462	49.6 +/- 1.29(15)	47.8	51.2
07/31/84	97	463	49.8 +/- .55(15)	48.9	50.7
WEEK SUMMARY			AV = 49.7 n = 2	47.8	51.2
REPORT SUMMARY			AV = 50.0 n = 21	45.1	59.4



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                                  CHAMBER CONCENTRATIONS -- EDC/DS
                                 7452B:  ETHYLENE DICHLORIDE 50 PPM
                                         WEEK 97 THRU 101
           EXPOSURE       EXPOSURE                                          MINIMUM       MAXIMUM
   DATE      WEEK            DAY         MEAN +/- S.D. (n)                  READING       READING
 --------  --------       --------      -------------------                --------      --------
 08/01/84     97             464         50.5   +/-     .85(15)              49.1          52.1
 08/02/84     97             465         50.0   +/-     .86(14)              48.6          51.6
 08/03/84     97             466         50.7   +/-    1.39(14)              48.9          53.0
 WEEK SUMMARY                       AV = 50.4          n =    3              48.6          53.0
 ------------------------------------------------------------------------------------------------
 08/06/84     98             467         50.6   +/-    1.20(12)              48.9          53.0
 08/07/84     98             468         49.8   +/-    1.46(15)              48.0          54.4
 08/08/84     98             469         49.2   +/-    1.13(15)              46.7          50.3
 08/09/84     98             470         50.1   +/-    2.14(14)              44.5          54.1
 08/10/84     98             471         49.5   +/-    1.55(15)              46.3          52.0
 WEEK SUMMARY                       AV = 49.8          n =    5              44.5          54.4
 ------------------------------------------------------------------------------------------------
 08/13/84     99             472         49.4   +/-    3.40(15)              42.3          55.6
 08/14/84     99             473         49.8   +/-     .98(13)              47.7          50.9
 08/15/84     99             474         49.8   +/-    1.35(14)              47.4          51.9
 08/16/84     99             475         50.9   +/-     .50(14)              50.2          51.9
 08/17/84     99             476         49.9   +/-    1.89(15)              48.1          54.7
 WEEK SUMMARY                       AV = 50.0          n =    5              42.3          55.6
 ------------------------------------------------------------------------------------------------
 08/20/84    100             477         50.0   +/-    1.64(15)              45.0          52.9
 08/21/84    100             478         50.3   +/-     .77(15)              48.6          51.5
 08/22/84    100             479         49.2   +/-     .83(15)              47.7          50.6
 08/23/84    100             480         49.8   +/-    1.63(15)              46.5          52.2
 08/24/84    100             481         49.2   +/-    1.14(16)              45.7          50.6
 WEEK SUMMARY                       AV = 49.7          n =    5              45.0          52.9
 ------------------------------------------------------------------------------------------------
 08/27/84    101             482         49.8   +/-    1.18(15)              48.4          52.6
 08/28/84    101             483         50.0   +/-    1.50(15)              48.0          53.1
 08/29/84    101             484         50.1   +/-    1.82(15)              46.9          55.1
 08/30/84    101             485         49.7   +/-     .65(14)              48.6          50.9
 08/31/84    101             486         49.4   +/-    1.30(15)              47.3          52.2
 WEEK SUMMARY                       AV = 49.8          n =    5              46.9          55.1
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 REPORT SUMMARY                     AV = 49.9          n =   23              42.3          55.6
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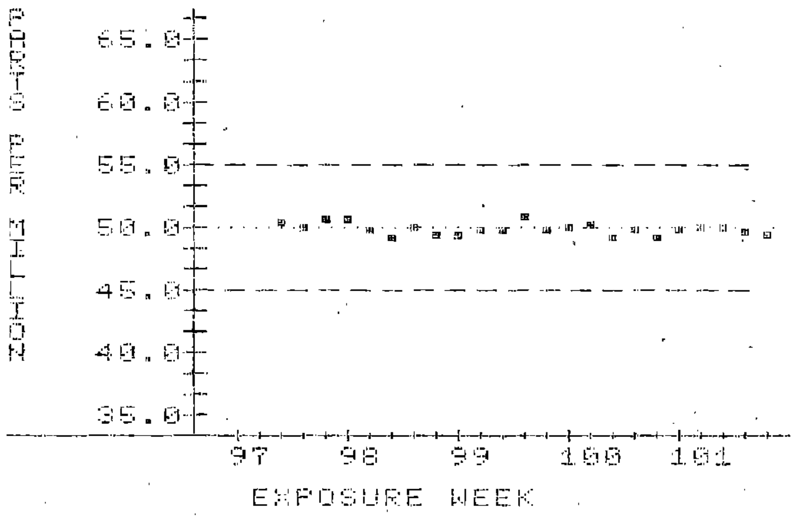


H. - HOLIDAY   N - OTHER   O - OFF SCALE

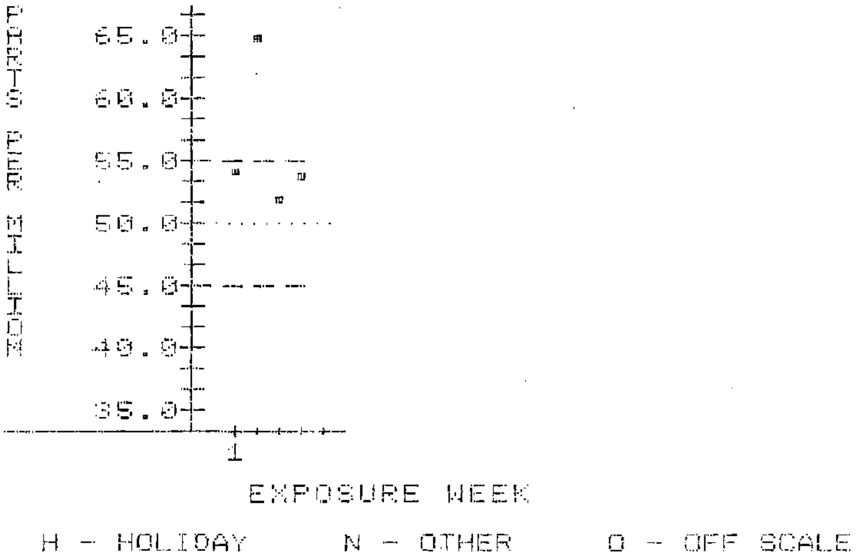
CHAMBER CONCENTRATIONS -- EDC/OS
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 102 THRU 103

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)		MINIMUM READING	MAXIMUM READING
09/03/84	102		HOLIDAY			
09/04/84	102	487	50.5 +/-	.77(14)	49.5	51.8
09/05/84	102	488	49.9 +/-	.79(15)	48.2	51.3
09/06/84	102	489	49.8 +/-	1.22(15)	48.0	52.5
09/07/84	102	490	50.3 +/-	1.21(15)	48.5	52.1
WEEK SUMMARY			AV = 50.1	n = 4	48.0	52.5
09/10/84	103	491	50.4 +/-	1.27(15)	48.6	52.3
09/11/84	103	492	50.0 +/-	.96(15)	48.5	51.4
09/12/84	103	493	49.6 +/-	1.19(15)	47.7	51.7
09/13/84	103	494	50.7 +/-	.88(16)	48.4	51.9
09/14/84	103	495	50.1 +/-	1.02(15)	48.5	51.8
WEEK SUMMARY			AV = 50.2	n = 5	47.7	52.3
REPORT SUMMARY			AV = 50.1	n = 9	47.7	52.5

EDC/ET CHAMBER CONCENTRATIONS (K6)

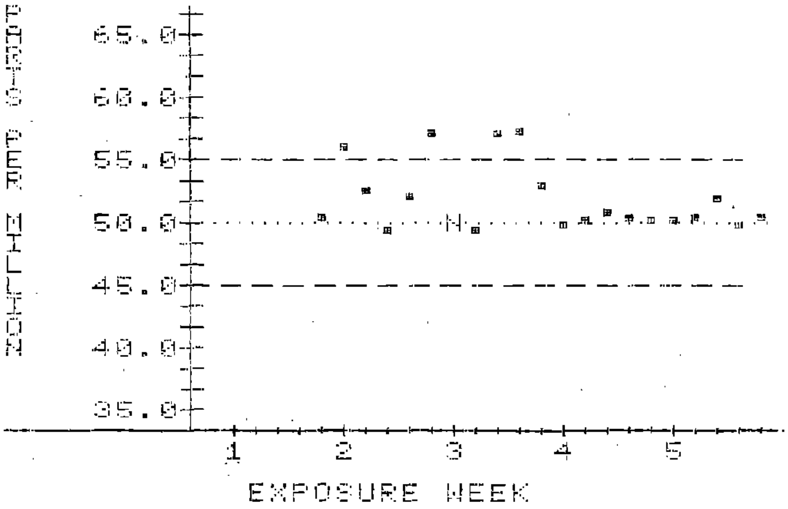
CHAMBER CONCENTRATIONS -- EDC/ET
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 1 THRU 1

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
09/27/82	1	1	54.1 +/- 2.55(7)	51.7	58.9
09/28/82	1	2	64.8 +/- 6.74(10)	49.7	71.0
09/29/82	1	3	51.8 +/- .89(13)	49.9	53.5
09/30/82	1	4	53.7 +/- .97(15)	52.4	55.0
WEEK SUMMARY			AV = 56.1 n = 4	49.7	71.0
REPORT SUMMARY			AV = 56.1 n = 4	49.7	71.0



CHAMBER CONCENTRATIONS -- EDC/ET
7452B: ETHYLENE DICHLORIDE 50 PPM
WEEK 1 THRU 5

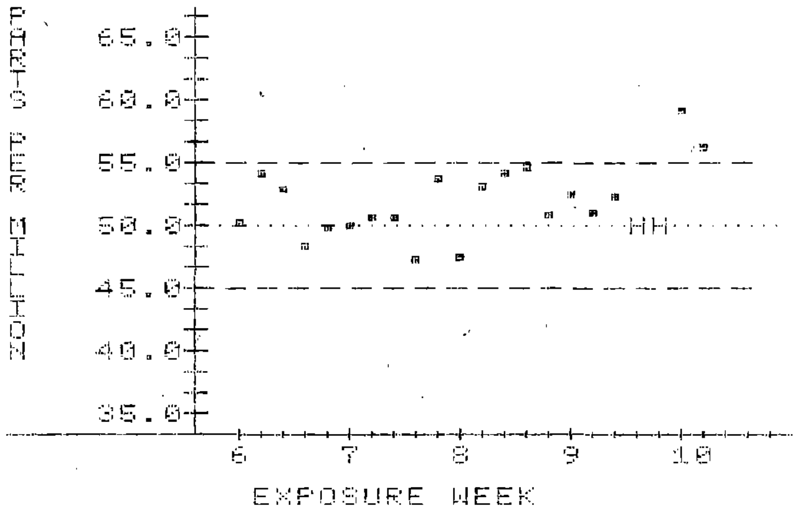
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
10/01/82	1	5	50.4 +/- .95(15)	48.0	51.7
WEEK SUMMARY			AV = 50.4 n = 1	48.0	51.7
10/04/82	2	6	56.0 +/- .67(12)	55.3	57.1
10/05/82	2	7	52.6 +/- 2.02(10)	48.6	54.3
10/06/82	2	8	49.5 +/- 4.16(14)	41.5	53.1
10/07/82	2	9	52.2 +/- 2.63(11)	50.1	57.0
10/08/82	2.	10	57.1 +/- 5.61(12)	45.8	65.9
WEEK SUMMARY			AV = 53.5 n = 5	41.5	65.9
10/11/82	3		NON-EXPOSURE		
10/12/82	3	11	49.5 +/- 5.51(15)	41.6	59.1
10/13/82	3	12	57.0 +/- 11.15(12)	42.2	77.7
10/14/82	3	13	57.2 +/- 10.26(16)	30.6	76.0
10/15/82	3	14	53.0 +/- 9.77(17)	44.0	72.6
WEEK SUMMARY			AV = 54.2 n = 4	30.6	77.7
10/18/82	4	15	49.9 +/- 2.18(11)	45.4	52.4
10/19/82	4	16	50.2 +/- 1.08(14)	48.2	51.9
10/20/82	4	17	50.8 +/- 1.51(13)	49.2	54.0
10/21/82	4	18	50.4 +/- .75(17)	49.1	52.1
10/22/82	4	19	50.2 +/- 1.39(17)	45.7	51.7
WEEK SUMMARY			AV = 50.3 n = 5	45.4	54.0
10/25/82	5	20	50.2 +/- 2.61(17)	45.5	54.6
10/26/82	5	21	50.4 +/- 2.29(14)	44.0	53.4
10/27/82	5	22	51.8 +/- 2.09(11)	47.7	53.9
10/28/82	5	23	49.8 +/- 1.47(16)	47.4	53.4
10/29/82	5	24	50.4 +/- 1.84(16)	47.5	52.9
WEEK SUMMARY			AV = 50.5 n = 5	44.0	54.6
REPORT SUMMARY			AV = 51.9 n = 20	30.6	77.7



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/ET
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 6 THRU 10

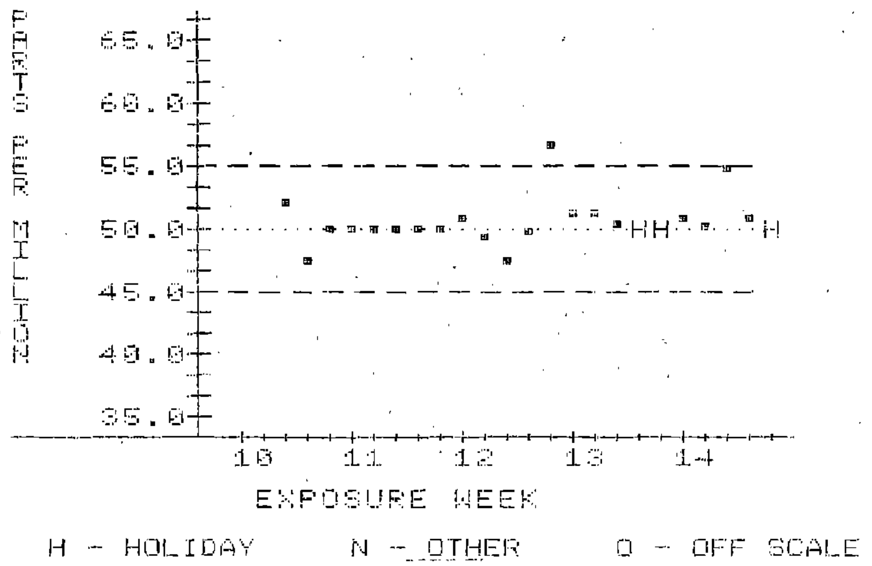
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
11/01/82	6	25	50.2 +/- 1.46(15)	45.3	51.7
11/02/82	6	26	54.2 +/- 3.17(4)	50.2	57.0
11/03/82	6	27	52.9 +/- 4.54(4)	48.6	58.9
11/04/82	6	28	48.3 +/- 1.86(6)	44.9	50.2
11/05/82	6	29	49.9 +/- 2.36(7)	46.3	53.8
WEEK SUMMARY			AV = 51.1 n = 5	44.9	58.9
11/08/82	7	30	50.1 +/- 2.53(7)	48.1	55.4
11/09/82	7	31	50.7 +/- 1.14(6)	49.6	52.5
11/10/82	7	32	50.7 +/- 1.72(7)	47.1	52.1
11/11/82	7	33	47.4 +/- 6.52(7)	40.5	54.2
11/12/82	7	34	53.8 +/- 3.74(7)	49.3	60.2
WEEK SUMMARY			AV = 50.5 n = 5	40.5	60.2
11/15/82	8	35	47.5 +/- 8.16(8)	38.9	62.9
11/16/82	8	36	53.2 +/- 9.08(8)	47.3	73.2
11/17/82	8	37	54.2 +/- 2.35(9)	51.3	58.7
11/18/82	8	38	54.5 +/- 6.36(7)	47.4	64.9
11/19/82	8	39	50.9 +/- 6.97(7)	43.1	59.5
WEEK SUMMARY			AV = 52.1 n = 5	38.9	73.2
11/22/82	9	40	52.5 +/- 4.42(11)	49.7	65.6
11/23/82	9	41	51.0 +/- 4.32(12)	44.7	59.2
11/24/82	9	42	52.3 +/- 4.25(11)	46.0	63.7
11/25/82	9		HOLIDAY		
11/26/82	9		HOLIDAY		
WEEK SUMMARY			AV = 51.9 n = 3	44.7	65.6
11/29/82	10	43	59.2 +/- 7.64(7)	46.1	66.6
11/30/82	10	44	56.3 +/- 3.18(7)	51.8	61.4
WEEK SUMMARY			AV = 57.8 n = 2	46.1	66.6
REPORT SUMMARY			AV = 52.0 n = 20	38.9	73.2



H - HOLIDAY N - OTHER O - OFF SCALE

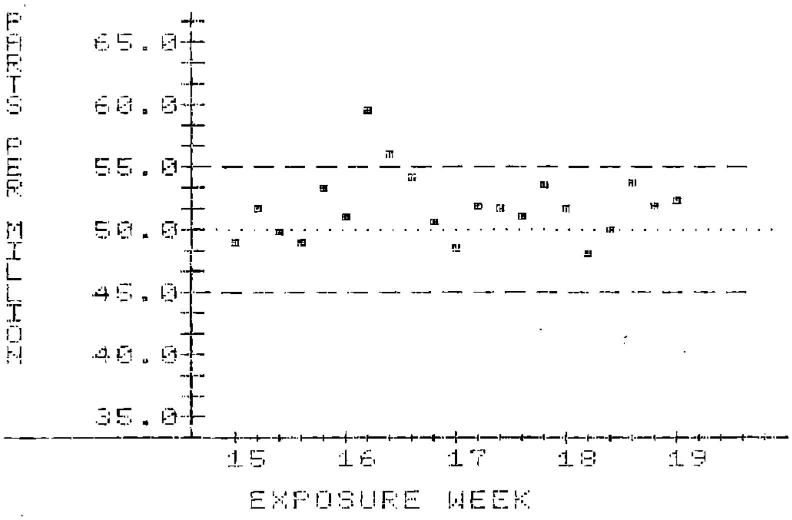
CHAMBER CONCENTRATIONS -- EDC/ET
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 10 THRU 14

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
12/01/82	10	45	52.2 +/- 3.30(8)	47.9	57.5
12/02/82	10	46	47.5 +/- 5.11(7)	40.5	55.9
12/03/82	10	47	50.0 +/- .00(8)	50.0	50.0
WEEK SUMMARY			AV = 49.9 n = 3	40.5	57.5
12/06/82	11	48	50.0 +/- .00(8)	50.0	50.0
12/07/82	11	49	50.0 +/- .00(8)	50.0	50.0
12/08/82	11	50	50.0 +/- .00(8)	50.0	50.0
12/09/82	11	51	50.0 +/- .00(8)	50.0	50.0
12/10/82	11	52	50.0 +/- .00(8)	50.0	50.0
WEEK SUMMARY			AV = 50.0 n = 5	50.0	50.0
12/13/82	12	53	50.8 +/- .95(8)	49.4	52.0
12/14/82	12	54	49.5 +/- 3.87(6)	44.6	54.7
12/15/82	12	55	47.6 +/- 4.01(7)	43.5	54.7
12/16/82	12	56	49.9 +/- 7.07(9)	41.0	57.9
12/17/82	12	57	56.6 +/- 3.48(6)	51.1	60.1
WEEK SUMMARY			AV = 50.9 n = 5	41.0	60.1
12/20/82	13	58	51.3 +/- 3.28(12)	46.1	57.2
12/21/82	13	59	51.2 +/- 1.80(13)	48.8	54.7
12/22/82	13	60	50.4 +/- .68(11)	49.2	51.5
12/23/82	13		HOLIDAY		
12/24/82	13		HOLIDAY		
WEEK SUMMARY			AV = 51.0 n = 3	46.1	57.2
12/27/82	14	61	50.9 +/- 1.83(9)	47.9	53.7
12/28/82	14	62	50.3 +/- 1.64(10)	46.7	51.4
12/29/82	14	63	54.7 +/- 1.24(13)	53.0	58.0
12/30/82	14	64	50.8 +/- 1.04(15)	49.4	54.1
12/31/82	14		HOLIDAY		
WEEK SUMMARY			AV = 51.7 n = 4	46.7	58.0
REPORT SUMMARY			AV = 50.7 n = 20	40.5	60.1



CHAMBER CONCENTRATIONS -- EDC/ET
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 15 THRU 19

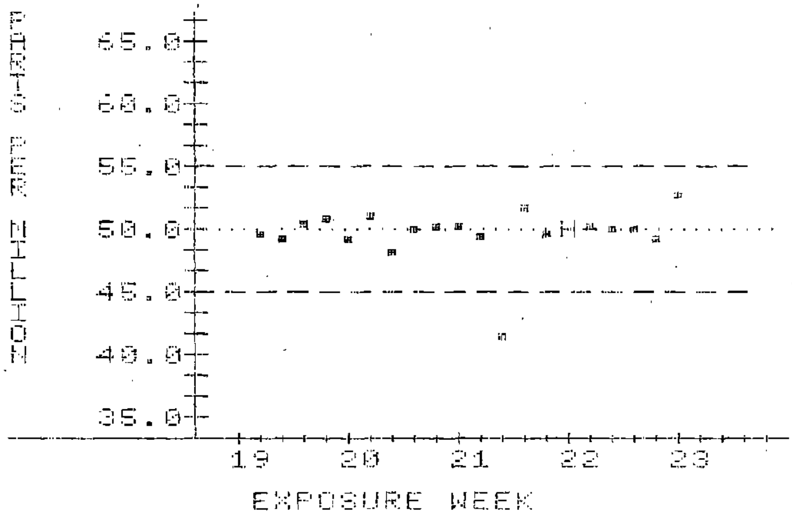
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
01/03/83	15	65	49.1 +/- 1.37(11)	46.8	51.8
01/04/83	15	66	51.7 +/- 1.59(13)	49.9	55.5
01/05/83	15	67	49.9 +/- .79(12)	49.1	51.5
01/06/83	15	68	49.1 +/- .87(14)	47.5	50.3
01/07/83	15	69	53.3 +/- 1.49(14)	50.0	55.8
WEEK SUMMARY			AV = 50.6 n = 5	46.8	55.8
01/10/83	16	70	51.1 +/- .79(13)	49.9	52.7
01/11/83	16	71	59.6 +/- 2.46(13)	54.0	61.3
01/12/83	16	72	56.1 +/- 3.68(13)	48.8	62.4
01/13/83	16	73	54.2 +/- 2.50(14)	49.8	57.3
01/14/83	16	74	50.6 +/- 2.51(12)	46.6	55.5
WEEK SUMMARY			AV = 54.3 n = 5	46.6	62.4
01/17/83	17	75	48.5 +/- 4.20(5)	43.9	53.3
01/18/83	17	76	51.8 +/- 1.69(11)	48.5	53.8
01/19/83	17	77	51.7 +/- .71(14)	50.6	52.7
01/20/83	17	78	51.1 +/- .54(14)	50.0	52.2
01/21/83	17	79	53.5 +/- 1.03(13)	52.0	55.1
WEEK SUMMARY			AV = 51.3 n = 5	43.9	55.1
01/24/83	18	80	51.6 +/- .51(13)	50.6	52.5
01/25/83	18	81	48.1 +/- 1.60(12)	44.5	50.4
01/26/83	18	82	50.1 +/- .41(13)	49.4	51.2
01/27/83	18	83	53.8 +/- 1.07(12)	52.6	55.7
01/28/83	18	84	51.9 +/- 1.71(13)	49.8	56.2
WEEK SUMMARY			AV = 51.1 n = 5	44.5	56.2
01/31/83	19	85	52.3 +/- 1.25(11)	51.2	55.7
WEEK SUMMARY			AV = 52.3 n = 1	51.2	55.7
REPORT SUMMARY			AV = 51.9 n = 21	43.9	62.4



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/ET
7452B: ETHYLENE DICHLORIDE 50 PPM
WEEK 19 THRU 23

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
02/01/83	19	86	49.7 +/- 1.08(9)	48.7	51.5
02/02/83	19	87	49.2 +/- .96(14)	48.4	52.3
02/03/83	19	88	50.4 +/- 1.56(14)	48.1	54.0
02/04/83	19	89	50.9 +/- .86(14)	49.7	53.5
WEEK SUMMARY			AV = 50.1 n = 4	48.1	54.0
02/07/83	20	90	49.3 +/- 2.60(5)	45.3	51.8
02/08/83	20	91	51.0 +/- 2.10(11)	47.3	56.3
02/09/83	20	92	48.1 +/- 1.66(13)	44.3	50.4
02/10/83	20	93	50.0 +/- 1.97(14)	46.5	52.6
02/11/83	20	94	50.2 +/- 1.49(13)	46.9	52.0
WEEK SUMMARY			AV = 49.7 n = 5	44.3	56.3
02/14/83	21	95	50.3 +/- 1.76(13)	48.4	53.7
02/15/83	21	96	49.5 +/- 1.26(13)	46.3	51.3
02/16/83	21	97	41.6 +/- 1.23(11)	40.7	45.1
02/17/83	21	98	51.7 +/- 2.07(12)	47.2	54.4
02/18/83	21	99	49.6 +/- 1.61(13)	46.0	51.8
WEEK SUMMARY			AV = 48.5 n = 5	40.7	54.4
02/21/83	22		HOLIDAY		
02/22/83	22	100	50.2 +/- .98(13)	48.0	51.3
02/23/83	22	101	50.0 +/- 1.82(13)	45.2	51.6
02/24/83	22	102	50.1 +/- 1.06(12)	47.7	51.5
02/25/83	22	103	49.2 +/- 1.44(14)	44.7	51.4
WEEK SUMMARY			AV = 49.9 n = 4	44.7	51.6
02/28/83	23	104	52.8 +/- 2.10(12)	49.3	56.0
WEEK SUMMARY			AV = 52.8 n = 1	49.3	56.0
REPORT SUMMARY			AV = 49.7 n = 19	40.7	56.3



H - HOLIDAY N - OTHER O - OFF SCALE

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                         CHAMBER CONCENTRATIONS -- EDC/ET
                        7452B:  ETHYLENE DICHLORIDE 50 PPM
                                  WEEK 23 THRU 27
             EXPOSURE     EXPOSURE                                    MINIMUM     MAXIMUM
   DATE        WEEK         DAY         MEAN +/- S.D. (n)             READING     READING
 --------   ---------    ---------    ---------------------           -------     -------
 03/01/83      23           105         50.9  +/-   5.52(11)           43.6        59.7
 03/02/83      23           106         52.0  +/-   2.23(12)           45.7        54.4
 03/03/83      23           107         50.3  +/-   1.50(13)           49.0        54.6
 03/04/83      23           108         50.4  +/-   1.97(12)           45.5        52.1
 WEEK SUMMARY                      AV = 50.9        n =    4           43.6        59.7
 ---------------------------------------------------------------------------------------
 03/07/83      24           109         47.1  +/-   1.26(10)           45.4        49.8
 03/08/83      24           110         49.3  +/-   2.56(12)           46.8        56.5
 03/09/83      24           111         49.1  +/-    .49(12)           48.3        50.4
 03/10/83      24           112         54.0  +/-   1.37(11)           51.7        55.9
 03/11/83      24           113         49.2  +/-   1.05(11)           47.5        51.1
 WEEK SUMMARY                      AV = 49.7        n =    5           45.4        56.5
 ---------------------------------------------------------------------------------------
 03/14/83      25           114         52.7  +/-   3.09(11)           47.1        57.2
 03/15/83      25           115         49.7  +/-   1.76(11)           48.1        54.0
 03/16/83      25           116         52.6  +/-   2.08(11)           47.0        55.8
 03/17/83      25           117         51.6  +/-   1.65(12)           50.2        55.4
 03/18/83      25           118         42.5  +/-   1.33(11)           41.1        45.1
 WEEK SUMMARY                      AV = 49.8        n =    5           41.1        57.2
 ---------------------------------------------------------------------------------------
 03/21/83      26           119         42.1  +/-   3.42(11)           37.2        47.5
 03/22/83      26           120         51.1  +/-   2.07( 6)           47.9        53.7
 03/23/83      26           121         52.6  +/-   2.55(13)           48.2        57.6
 03/24/83      26           122         40.4  +/-   1.14(13)           37.7        42.1
 03/25/83      26           123         40.6  +/-    .92(13)           38.9        42.2
 WEEK SUMMARY                      AV = 45.4        n =    5           37.2        57.6
 ---------------------------------------------------------------------------------------
 03/28/83      27           124         50.3  +/-   2.07(12)           45.7        52.7
 03/29/83      27           125         41.4  +/-    .49(11)           40.3        42.1
 03/30/83      27           126         39.8  +/-   2.64(12)           37.3        46.2
 03/31/83      27           127         48.8  +/-   5.37(12)           37.4        55.9
 WEEK SUMMARY                      AV = 45.1        n =    4           37.3        55.9
 ---------------------------------------------------------------------------------------
 REPORT SUMMARY                    AV = 48.2        n =   23           37.2        59.7
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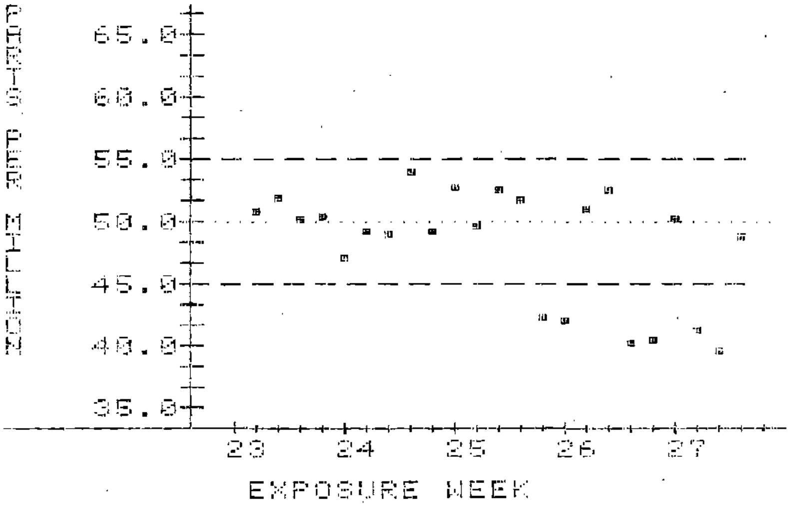
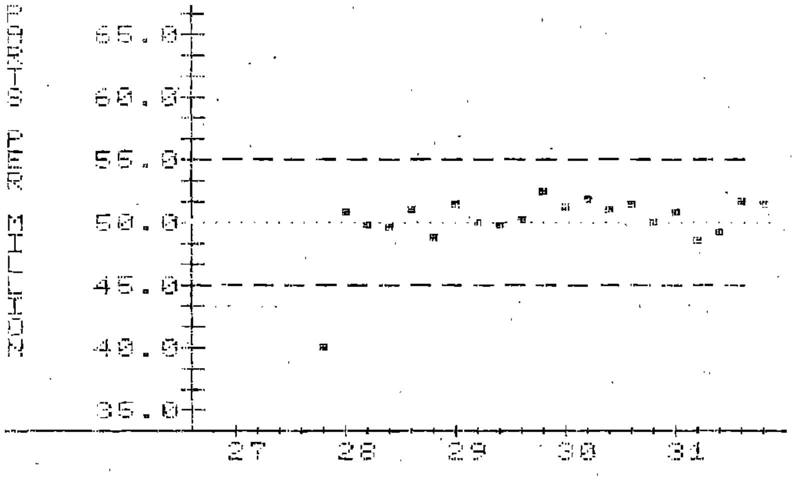


H - HOLIDAY   N - OTHER   O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/ET
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 27 THRU 31

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
04/01/83	27	128	40.1 +/- 2.03(5)	36.7	41.8
WEEK SUMMARY			AV = 40.1 n = 1	36.7	41.8
04/04/83	28	129	50.9 +/- 1.18(11)	49.9	54.1
04/05/83	28	130	49.9 +/- .74(12)	48.7	51.2
04/06/83	28	131	49.7 +/- 2.21(12)	45.7	54.2
04/07/83	28	132	51.1 +/- 2.31(12)	48.1	54.3
04/08/83	28	133	48.8 +/- 1.59(12)	46.2	52.1
WEEK SUMMARY			AV = 50.1 n = 5	45.7	54.3
04/11/83	29	134	51.4 +/- 1.37(7)	49.2	53.0
04/12/83	29	135	50.1 +/- 1.59(12)	47.2	51.7
04/13/83	29	136	49.9 +/- .96(12)	48.9	52.5
04/14/83	29	137	50.2 +/- 3.24(10)	44.6	53.7
04/15/83	29	138	52.5 +/- 5.55(12)	45.2	61.6
WEEK SUMMARY			AV = 50.8 n = 5	44.6	61.6
04/18/83	30	139	51.2 +/- 2.71(12)	47.6	55.7
04/19/83	30	140	51.9 +/- 1.10(12)	50.3	53.9
04/20/83	30	141	51.1 +/- 2.87(11)	46.1	55.7
04/21/83	30	142	51.4 +/- 2.24(12)	48.8	57.8
04/22/83	30	143	50.1 +/- 1.18(12)	47.3	51.7
WEEK SUMMARY			AV = 51.1 n = 5	46.1	57.8
04/25/83	31	144	50.8 +/- 2.35(10)	47.5	56.0
04/26/83	31	145	48.6 +/- .93(12)	47.1	50.2
04/27/83	31	146	49.3 +/- 5.01(12)	40.7	57.6
04/28/83	31	147	51.7 +/- 1.97(11)	48.7	55.9
04/29/83	31	148	51.5 +/- 1.10(10)	50.5	54.1
WEEK SUMMARY			AV = 50.4 n = 5	40.7	57.6
REPORT SUMMARY			AV = 50.1 n = 21	36.7	61.6

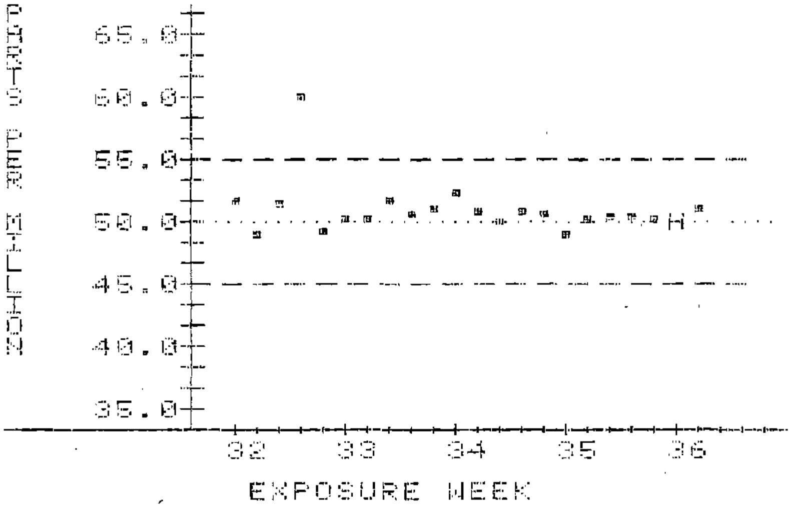


EXPOSURE WEEK

H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/ET
7452B: ETHYLENE DICHLORIDE 50 PPM
WEEK 32 THRU 36

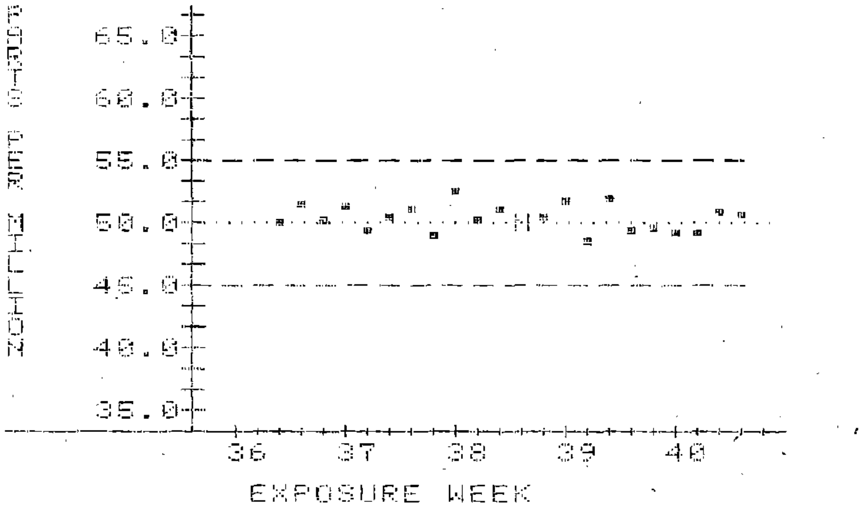
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
05/02/83	32	149	51.6 +/- 3.07(12)	47.1	54.8
05/03/83	32	150	49.1 +/- 2.12(13)	46.0	51.9
05/04/83	32	151	51.5 +/- 1.42(12)	49.7	55.0
05/05/83	32	152	59.9 +/- 12.73(10)	45.6	80.9
05/06/83	32	153	49.3 +/- 3.37(13)	43.5	56.4
WEEK SUMMARY			AV = 52.3 n = 5	43.5	80.9
05/09/83	33	154	50.2 +/- 1.26(12)	47.4	51.9
05/10/83	33	155	50.3 +/- .96(12)	48.7	52.3
05/11/83	33	156	51.6 +/- 1.70(12)	48.8	54.2
05/12/83	33	157	50.6 +/- 1.25(11)	45.2	52.1
05/13/83	33	158	51.0 +/- 2.11(12)	46.8	54.3
WEEK SUMMARY			AV = 50.7 n = 5	46.8	54.3
05/16/83	34	159	52.3 +/- 4.54(9)	44.7	59.9
05/17/83	34	160	50.8 +/- 1.96(12)	48.5	54.9
05/18/83	34	161	50.0 +/- .94(11)	48.2	51.6
05/19/83	34	162	50.8 +/- 1.18(12)	48.7	53.1
05/20/83	34	163	50.6 +/- 3.32(11)	46.3	54.5
WEEK SUMMARY			AV = 50.9 n = 5	44.7	59.9
05/23/83	35	164	49.0 +/- 3.46(11)	43.5	54.6
05/24/83	35	165	50.2 +/- 1.30(11)	47.8	52.1
05/25/83	35	166	50.4 +/- 2.13(13)	46.7	53.1
05/26/83	35	167	50.5 +/- 1.25(13)	48.3	52.1
05/27/83	35	168	50.2 +/- 2.13(13)	48.2	56.8
WEEK SUMMARY			AV = 50.1 n = 5	43.5	56.8
05/30/83	36		HOLIDAY		
05/31/83	36	169	51.1 +/- 3.37(12)	46.5	58.8
WEEK SUMMARY			AV = 51.1 n = 1	46.5	58.8
REPORT SUMMARY			AV = 51.0 n = 21	43.5	80.9



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/ET
7452B: ETHYLENE DICHLORIDE 50 PPM
WEEK 36 THRU 40

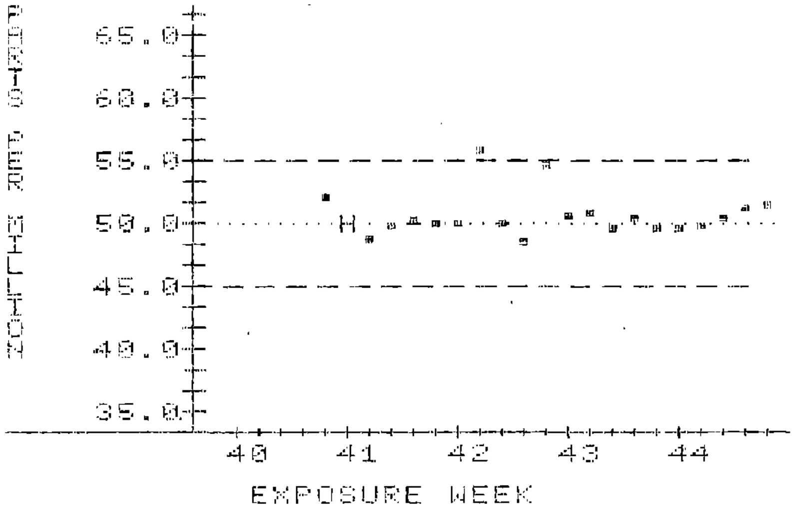
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
06/01/83	36	170	50.0 +/- 1.22(13)	48.5	52.8
06/02/83	36	171	51.5 +/- 2.73(12)	46.9	57.5
06/03/83	36	172	50.2 +/- .71(12)	49.3	51.4
WEEK SUMMARY			AV = 50.6 n = 3	46.9	57.5
06/06/83	37	173	51.3 +/- 1.13(12)	49.2	52.6
06/07/83	37	174	49.5 +/- 1.50(10)	47.2	51.3
06/08/83	37	175	50.5 +/- 2.86(12)	43.9	55.8
06/09/83	37	176	51.0 +/- 1.00(13)	49.3	52.7
06/10/83	37	177	49.1 +/- 2.66(12)	45.4	53.7
WEEK SUMMARY			AV = 50.3 n = 5	43.9	55.8
06/13/83	38	178	52.5 +/- 2.27(13)	46.7	55.2
06/14/83	38	179	50.2 +/- 1.93(12)	47.0	54.9
06/15/83	38	180	51.0 +/- 4.52(12)	45.7	63.0
06/16/83	38		NON-EXPOSURE		
06/17/83	38	181	50.5 +/- 2.05(13)	45.7	52.9
WEEK SUMMARY			AV = 51.1 n = 4	45.7	63.0
06/20/83	39	182	51.6 +/- 2.54(12)	47.2	56.2
06/21/83	39	183	48.6 +/- 2.13(13)	47.3	55.4
06/22/83	39	184	51.8 +/- 2.03(13)	48.3	55.0
06/23/83	39	185	49.4 +/- 1.79(13)	47.6	54.6
06/24/83	39	186	49.6 +/- 1.94(13)	47.2	55.5
WEEK SUMMARY			AV = 50.2 n = 5	47.2	56.2
06/27/83	40	187	49.3 +/- 1.48(12)	47.1	52.6
06/28/83	40	188	49.3 +/- .97(12)	47.8	51.1
06/29/83	40	189	50.8 +/- .99(11)	49.1	52.1
06/30/83	40	190	50.6 +/- 1.39(13)	48.4	52.7
WEEK SUMMARY			AV = 50.0 n = 4	47.1	52.7
REPORT SUMMARY			AV = 50.4 n = 21	43.9	63.0



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/ET
7452B: ETHYLENE DICHLORIDE 50 PPM
WEEK 40 THRU 44

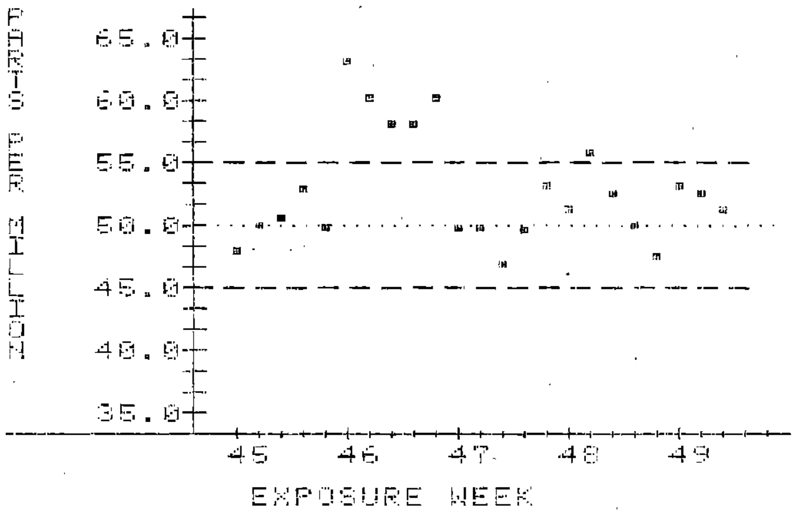
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
07/01/83	40	191	52.2 +/- 1.77(12)	49.1	54.6
WEEK SUMMARY			AV = 52.2 n = 1	49.1	54.6
07/04/83	41		HOLIDAY		
07/05/83	41	192	48.7 +/- 1.04(11)	46.7	50.0
07/06/83	41	193	49.9 +/- 1.76(12)	46.2	52.3
07/07/83	41	194	50.2 +/- 1.83(13)	45.6	52.2
07/08/83	41	195	50.1 +/- .70(11)	49.1	50.8
WEEK SUMMARY			AV = 49.7 n = 4	45.6	52.3
07/11/83	42	196	50.1 +/- 1.91(13)	46.6	52.9
07/12/83	42	197	55.8 +/- 1.85(13)	53.4	59.2
07/13/83	42	198	50.0 +/- 1.01(13)	48.6	51.6
07/14/83	42	199	48.6 +/- 1.51(13)	45.0	50.5
07/15/83	42	200	54.5 +/- 1.53(13)	51.4	56.1
WEEK SUMMARY			AV = 51.8 n = 5	45.0	59.2
07/18/83	43	201	50.7 +/- 2.12(12)	44.6	53.2
07/19/83	43	202	50.9 +/- 2.11(13)	47.3	54.3
07/20/83	43	203	49.7 +/- 1.23(13)	47.4	51.7
07/21/83	43	204	50.5 +/- 2.03(13)	47.8	53.4
07/22/83	43	205	49.7 +/- .73(13)	48.4	50.9
WEEK SUMMARY			AV = 50.3 n = 5	44.6	54.3
07/25/83	44	206	49.7 +/- 1.18(13)	46.7	51.6
07/26/83	44	207	49.8 +/- .78(14)	48.1	51.3
07/27/83	44	208	50.4 +/- .81(14)	48.8	51.3
07/28/83	44	209	51.2 +/- 1.04(14)	48.1	52.5
07/29/83	44	210	51.4 +/- .46(13)	50.6	52.2
WEEK SUMMARY			AV = 50.5 n = 5	46.7	52.5
REPORT SUMMARY			AV = 50.7 n = 20	44.6	59.2



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/ET
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 45 THRU 49

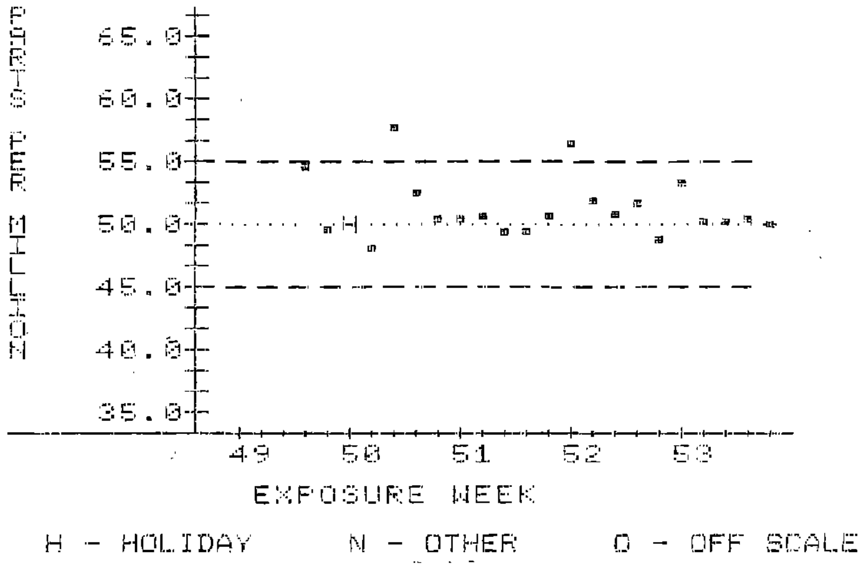
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. ´(n)	MINIMUM READING	MAXIMUM READING
08/01/83	45	211	48.0 +/- 1.45(12)	46.8	51.7
08/02/83	45	212	50.1 +/- .72(14)	49.3	51.5
08/03/83	45	213	50.6 +/- 1.89(14)	45.7	52.1
08/04/83	45	214	53.0 +/- 1.31(14)	50.3	54.8
08/05/83	45	215	49.8 +/- 1.45(13)	48.3	52.0
WEEK SUMMARY			AV = 50.3 n = 5	45.7	54.8
08/08/83	46	216	63.0 +/- 2.20(13)	58.2	64.8
08/09/83	46	217	60.2 +/- .90(13)	58.8	61.9
08/10/83	46	218	58.1 +/- 1.26(14)	56.9	62.1
08/11/83	46	219	58.1 +/- 1.45(14)	55.3	60.1
08/12/83	46	220	60.2 +/- 1.96(14)	56.2	62.8
WEEK SUMMARY			AV = 59.9 n = 5	55.3	64.8
08/15/83	47	221	49.8 +/- 1.55(14)	46.7	52.4
08/16/83	47	222	49.9 +/- 1.56(13)	47.5	51.9
08/17/83	47	223	47.0 +/- .94(12)	44.4	48.1
08/18/83	47	224	49.7 +/- 1.35(13)	45.8	50.9
08/19/83	47	225	53.2 +/- 1.34(14)	50.4	54.9
WEEK SUMMARY			AV = 49.9 n = 5	44.4	54.9
08/22/83	48	226	51.3 +/- 1.32(13)	48.4	52.5
08/23/83	48	227	55.9 +/- .86(14)	54.5	57.0
08/24/83	48	228	52.6 +/- 1.14(13)	50.8	54.1
08/25/83	48	229	50.1 +/- 1.11(12)	48.6	51.9
08/26/83	48	230	47.5 +/- 1.00(13)	46.2	49.6
WEEK SUMMARY			AV = 51.5 n = 5	46.2	57.0
08/29/83	49	231	53.2 +/- 1.80(11)	48.2	55.3
08/30/83	49	232	52.5 +/- .75(12)	51.0	53.1
08/31/83	49	233	51.3 +/- .67(13)	50.2	52.4
WEEK SUMMARY			AV = 52.3 n = 3	48.2	55.3
REPORT SUMMARY			AV = 52.8 n = 23	44.4	64.8



H - HOLIDAY   N - OTHER   O - OFF SCALE

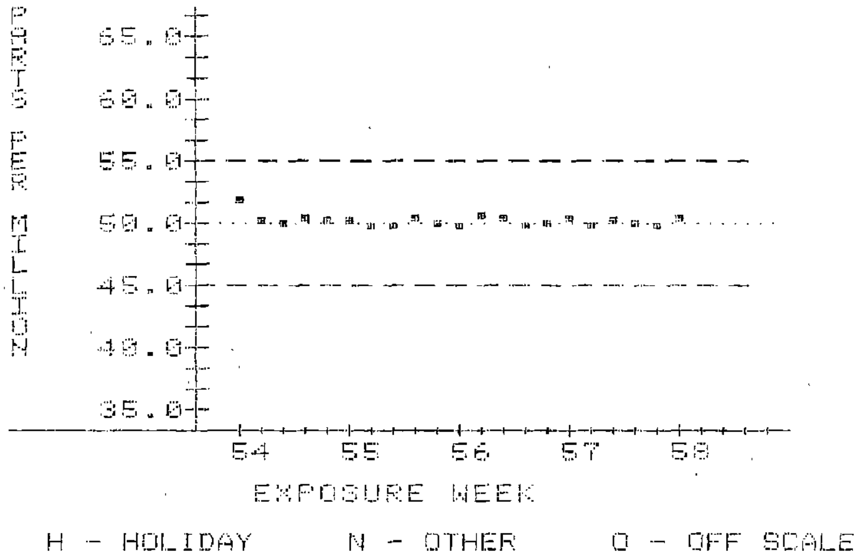
CHAMBER CONCENTRATIONS -- EDC/ET
7452B: ETHYLENE DICHLORIDE 50 PPM
WEEK 49 THRU 53

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
09/01/83	49	234	54.6 +/- 1.11(13)	52.3	56.1
09/02/83	49	235	49.6 +/- 1.07(13)	47.8	51.7
WEEK SUMMARY			AV = 52.1 n = 2	47.8	56.1
09/05/83	50		HOLIDAY		
09/06/83	50	236	48.2 +/- 1.87(11)	45.3	50.3
09/07/83	50	237	57.7 +/- 2.19(12)	55.1	60.9
09/08/83	50	238	52.6 +/- 1.42(14)	49.4	54.6
09/09/83	50	239	50.4 +/- 3.01(6)	45.9	55.1
WEEK SUMMARY			AV = 52.2 n = 4	45.3	60.9
09/12/83	51	240	50.5 +/- .75(8)	49.2	51.3
09/13/83	51	241	50.6 +/- 2.19(7)	49.3	55.4
09/14/83	51	242	49.4 +/- 2.34(8)	44.5	52.3
09/15/83	51	243	49.4 +/- 2.08(9)	46.4	52.6
09/16/83	51	244	50.6 +/- 1.73(7)	47.1	51.9
WEEK SUMMARY			AV = 50.1 n = 5	44.5	55.4
09/19/83	52	245	56.4 +/- 1.68(9)	54.6	59.7
09/20/83	52	246	52.0 +/- .75(12)	50.2	53.2
09/21/83	52	247	50.9 +/- 2.01(11)	45.9	52.9
09/22/83	52	248	51.7 +/- 1.04(13)	51.0	55.0
09/23/83	52	249	48.8 +/- .59(13)	48.0	49.8
WEEK SUMMARY			AV = 52.0 n = 5	45.9	59.7
09/26/83	53	250	53.4 +/- 1.77(12)	48.5	55.1
09/27/83	53	251	50.3 +/- 1.51(13)	47.6	52.1
09/28/83	53	252	50.2 +/- 1.38(13)	47.6	51.9
09/29/83	53	253	50.5 +/- 2.33(11)	46.8	53.5
09/30/83	53	254	50.1 +/- .67(10)	48.8	50.9
WEEK SUMMARY			AV = 50.9 n = 5	46.8	55.1
REPORT SUMMARY			AV = 51.3 n = 21	44.5	60.9



CHAMBER CONCENTRATIONS -- EDC/ET
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 54 THRU 58

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
10/03/83	54	255	52.0 +/- 1.25(12)	50.5	54.5
10/04/83	54	256	50.3 +/- .50(13)	49.6	51.5
10/05/83	54	257	50.0 +/- .47(12)	49.3	51.0
10/06/83	54	258	50.4 +/- .46(12)	49.3	51.1
10/07/83	54	259	50.3 +/- .45(12)	49.7	51.4
WEEK SUMMARY			AV = 50.6 n = 5	49.3	54.5
10/10/83	55	260	50.3 +/- .72(12)	48.9	51.4
10/11/83	55	261	49.8 +/- 1.04(12)	48.2	51.2
10/12/83	55	262	49.8 +/- .44(13)	49.2	50.6
10/13/83	55	263	50.4 +/- .77(13)	49.2	52.0
10/14/83	55	264	50.0 +/- .95(13)	48.1	51.1
WEEK SUMMARY			AV = 50.1 n = 5	48.1	52.0
10/17/83	56	265	49.9 +/- 1.05(13)	48.2	52.0
10/18/83	56	266	50.6 +/- 1.37(12)	48.6	53.3
10/19/83	56	267	50.5 +/- 1.49(13)	47.3	52.5
10/20/83	56	268	49.8 +/- 1.92(13)	47.1	52.6
10/21/83	56	269	50.1 +/- 1.18(13)	46.9	51.0
WEEK SUMMARY			AV = 50.2 n = 5	46.9	53.3
10/24/83	57	270	50.4 +/- 1.73(12)	45.4	51.8
10/25/83	57	271	49.9 +/- .87(12)	48.7	51.3
10/26/83	57	272	50.3 +/- .88(13)	48.4	51.4
10/27/83	57	273	50.0 +/- .88(13)	48.9	52.1
10/28/83	57	274	49.9 +/- 1.43(12)	47.4	52.4
WEEK SUMMARY			AV = 50.1 n = 5	45.4	52.4
10/31/83	58	275	50.5 +/- .65(13)	49.6	51.7
WEEK SUMMARY			AV = 50.5 n = 1	49.6	51.7
REPORT SUMMARY			AV = 50.2 n = 21	45.4	54.5



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                       CHAMBER CONCENTRATIONS -- EDC/ET
                      74528:  ETHYLENE DICHLORIDE 50 PPM
                              WEEK 58 THRU 62
           EXPOSURE    EXPOSURE                                   MINIMUM    MAXIMUM
  DATE       WEEK         DAY        MEAN +/- S.D. (n)            READING    READING
---------  ---------   ---------    ------------------------      -------    -------
11/01/83      58          276        50.0  +/-   1.12(13)          48.4       51.6
11/02/83      58          277        50.0  +/-   1.08(13)          48.0       51.5
11/03/83      58          278        49.9  +/-   1.20(12)          48.4       52.3
11/04/83      58          279        50.0  +/-   1.28(12)          47.6       51.5
WEEK SUMMARY                    AV = 50.0        n =    4          47.6       52.3
------------------------------------------------------------------------------------
11/07/83      59          280        50.0  +/-   1.82(12)          46.9       53.7
11/08/83      59          281        50.1  +/-   1.47(13)          46.6       51.4
11/09/83      59          282        50.0  +/-   1.28(13)          47.8       53.2
11/10/83      59          283        50.2  +/-   2.01(13)          47.8       53.6
11/11/83      59          284        50.1  +/-   1.01(13)          48.7       52.4
WEEK SUMMARY                    AV = 50.1        n =    5          46.6       53.7
------------------------------------------------------------------------------------
11/14/83      60          285        50.1  +/-   1.37(12)          46.9       51.5
11/15/83      60          286        49.9  +/-   1.49(11)          47.6       52.5
11/16/83      60          287        50.0  +/-   1.32(12)          47.1       52.0
11/17/83      60          288        50.1  +/-   1.23(11)          48.5       52.7
11/18/83      60          289        50.0  +/-   1.12(12)          48.4       52.9
WEEK SUMMARY                    AV = 50.0        n =    5          46.9       52.9
------------------------------------------------------------------------------------
11/21/83      61          290        50.8  +/-   2.40(11)          46.9       55.2
11/22/83      61          291        49.9  +/-    .97(12)          48.7       52.1
11/23/83      61          292        50.1  +/-   1.36(13)          46.8       52.5
11/24/83      61                         HOLIDAY
11/25/83      61                         HOLIDAY
WEEK SUMMARY                    AV = 50.3        n =    3          46.8       55.2
------------------------------------------------------------------------------------
11/28/83      62          293        50.0  +/-    .70(14)          48.9       51.0
11/29/83      62          294        49.9  +/-   1.53(13)          47.7       52.6
11/30/83      62          295        50.0  +/-    .75(13)          48.5       51.3
WEEK SUMMARY                    AV = 50.0        n =    3          47.7       52.6
------------------------------------------------------------------------------------
REPORT SUMMARY                  AV = 50.1        n =   20          46.6       55.2
------------------------------------------------------------------------------------
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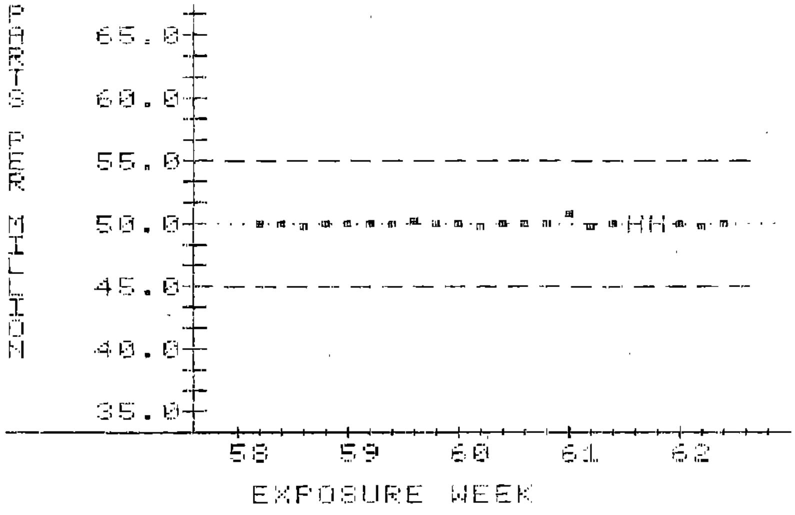
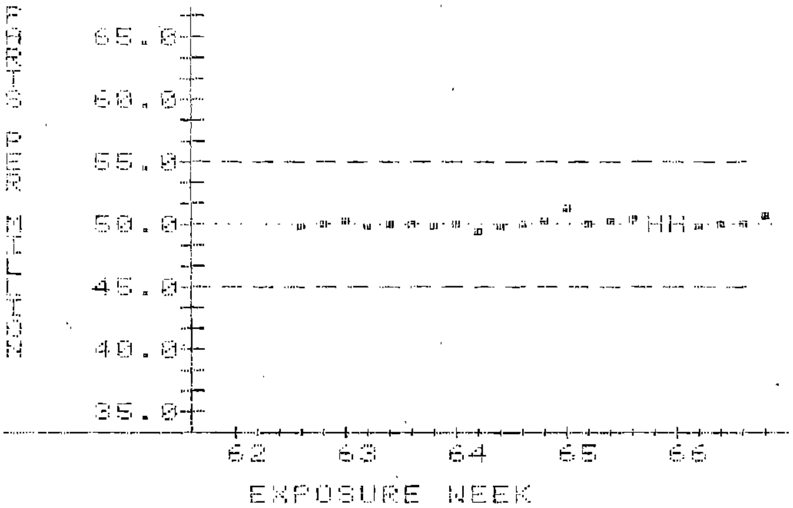


H - HOLIDAY   N - OTHER   O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/ET
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 62 THRU 66

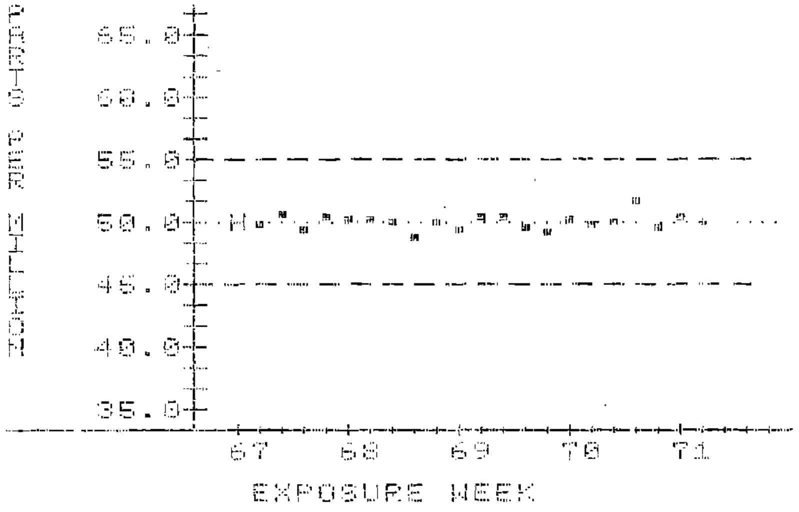
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
12/01/83	62	296	49.9 +/- .83(13)	48.7	51.1
12/02/83	62	297	50.0 +/- .96(12)	48.2	51.1
WEEK SUMMARY			AV = 50.0 n = 2	48.2	51.1
12/05/83	63	298	50.2 +/- .96(12)	48.2	51.7
12/06/83	63	299	49.9 +/- .63(13)	48.5	51.1
12/07/83	63	300	50.0 +/- 1.64(13)	46.4	52.8
12/08/83	63	301	50.0 +/- .95(13)	48.4	51.0
12/09/83	63	302	49.9 +/- 1.41(13)	46.8	52.0
WEEK SUMMARY			AV = 50.0 n = 5	46.4	52.8
12/12/83	64	303	50.1 +/- .94(12)	48.9	51.7
12/13/83	64	304	49.5 +/- 1.77(12)	44.6	51.0
12/14/83	64	305	49.8 +/- 1.12(12)	48.3	51.8
12/15/83	64	306	50.1 +/- .84(13)	47.9	51.3
12/16/83	64	307	50.2 +/- 1.50(11)	46.9	52.0
WEEK SUMMARY			AV = 49.9 n = 5	44.6	52.0
12/19/83	65	308	51.2 +/- 2.73(9)	47.6	56.4
12/20/83	65	309	50.0 +/- 1.26(12)	47.7	51.6
12/21/83	65	310	50.3 +/- 1.76(9)	47.4	53.0
12/22/83	65	311	50.4 +/- .59(13)	49.8	52.2
12/23/83	65		HOLIDAY		
WEEK SUMMARY			AV = 50.5 n = 4	47.4	56.4
12/26/83	66		HOLIDAY		
12/27/83	66	312	49.8 +/- 1.31(13)	48.0	52.4
12/28/83	66	313	50.1 +/- 1.29(13)	47.3	51.8
12/29/83	66	314	50.0 +/- .94(13)	48.9	52.0
12/30/83	66	315	50.6 +/- 1.27(12)	47.6	52.6
WEEK SUMMARY			AV = 50.1 n = 4	47.3	52.6
REPORT SUMMARY			AV = 50.1 n = 20	44.6	56.4



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/ET
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 67 THRU 71

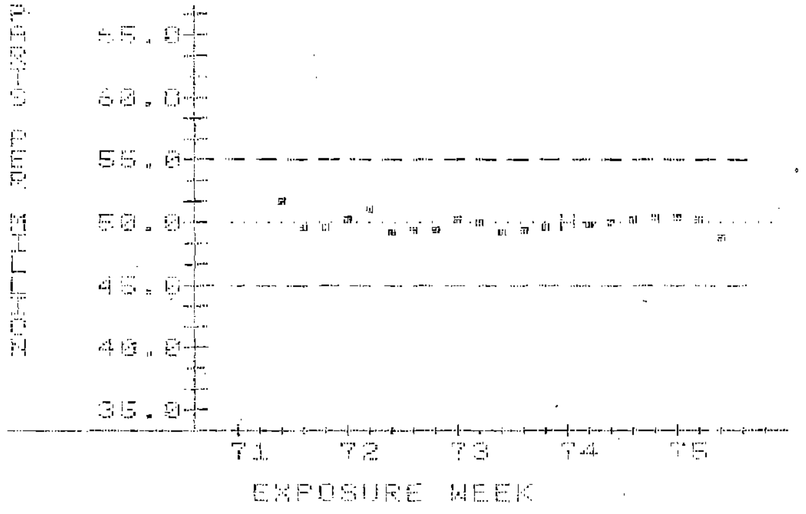
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXI READ
01/02/84	67		HOLIDAY		
01/03/84	67	316	49.9 +/- 1.65(12)	47.3	54.
01/04/84	67	317	50.6 +/- 2.18(10)	46.7	54.
01/05/84	67	318	49.5 +/- 1.82(13)	46.5	52.
01/06/84	67	319	50.4 +/- 1.53(12)	46.8	51.
WEEK SUMMARY			AV = 50.1 n = 4	46.5	54.
01/09/84	68	320	50.2 +/- 1.97(13)	46.2	54.
01/10/84	68	321	50.3 +/- 2.28(13)	46.1	53.
01/11/84	68	322	50.1 +/- 1.06(11)	48.5	51.
01/12/84	68	323	48.9 +/- 2.18(13)	43.8	51.
01/13/84	68	324	50.0 +/- 1.00(12)	48.0	51.
WEEK SUMMARY			AV = 49.9 n = 5	43.8	54.
01/16/84	69	325	49.4 +/- 1.15(13)	47.5	51.
01/17/84	69	326	50.4 +/- .92(13)	48.1	52.
01/18/84	69	327	50.4 +/- .92(12)	49.6	53.
01/19/84	69	328	49.6 +/- 1.23(14)	47.0	51.
01/20/84	69	329	49.3 +/- 3.00(13)	42.8	54.
WEEK SUMMARY			AV = 49.8 n = 5	42.8	54.
01/23/84	70	330	50.2 +/- 1.27(14)	48.1	52.
01/24/84	70	331	49.9 +/- .96(11)	47.7	51.
01/25/84	70	332	50.1 +/- 1.29(13)	47.7	51.
01/26/84	70	333	51.7 +/- 5.24(11)	44.7	62.
01/27/84	70	334	49.7 +/- 1.56(13)	47.0	52.
WEEK SUMMARY			AV = 50.3 n = 5	44.7	62.
01/30/84	71	335	50.4 +/- 1.25(11)	49.0	53.
01/31/84	71	336	50.0 +/- 1.65(13)	46.2	52.
WEEK SUMMARY			AV = 50.2 n = 2	46.2	53.
REPORT SUMMARY			AV = 50.0 n = 21	42.8	62.



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/ET
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 71 THRU 75

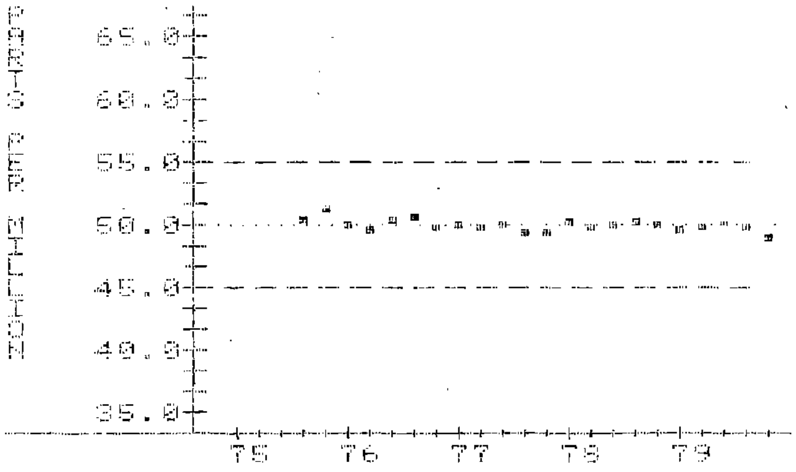
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)			MINIMUM READING	MAXIMUM READING
02/01/84	71	337	51.7	+/-	2.46(9)	48.5	54.7
02/02/84	71	338	49.7	+/-	.85(13)	48.8	51.6
02/03/84	71	339	49.7	+/-	1.09(8)	48.6	51.4
WEEK SUMMARY			AV = 50.4		n = 3	48.5	54.7
02/06/84	72	340	50.3	+/-	1.08(14)	48.1	52.1
02/07/84	72	341	51.1	+/-	1.27(14)	48.1	53.0
02/08/84	72	342	49.2	+/-	1.35(15)	46.2	51.4
02/09/84	72	343	49.5	+/-	1.15(13)	47.4	51.0
02/10/84	72	344	49.5	+/-	1.70(14)	45.8	52.4
WEEK SUMMARY			AV = 49.9		n = 5	45.8	53.0
02/13/84	73	345	50.2	+/-	1.02(14)	47.6	51.9
02/14/84	73	346	50.1	+/-	.74(13)	49.3	51.6
02/15/84	73	347	49.2	+/-	.38(13)	48.7	49.8
02/16/84	73	348	49.5	+/-	.72(16)	47.3	50.9
02/17/84	73	349	49.6	+/-	.82(14)	48.4	51.0
WEEK SUMMARY			AV = 49.7		n = 5	47.3	51.9
02/20/84	74		HOLIDAY				
02/21/84	74	350	49.9	+/-	1.09(15)	47.5	51.8
02/22/84	74	351	50.0	+/-	1.26(15)	46.8	51.3
02/23/84	74	352	50.5	+/-	1.71(15)	47.8	52.8
02/24/84	74	353	50.4	+/-	.57(15)	49.6	50.9
WEEK SUMMARY			AV = 50.2		n = 4	46.8	52.8
02/27/84	75	354	50.4	+/-	1.59(15)	47.7	52.9
02/28/84	75	355	50.2	+/-	1.83(12)	45.9	52.0
02/29/84	75	356	48.7	+/-	1.16(13)	45.9	49.7
WEEK SUMMARY			AV = 49.8		n = 3	45.9	52.9
REPORT SUMMARY			AV = 50.0		n = 20	45.8	54.7



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/ET
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 75 THRU 79

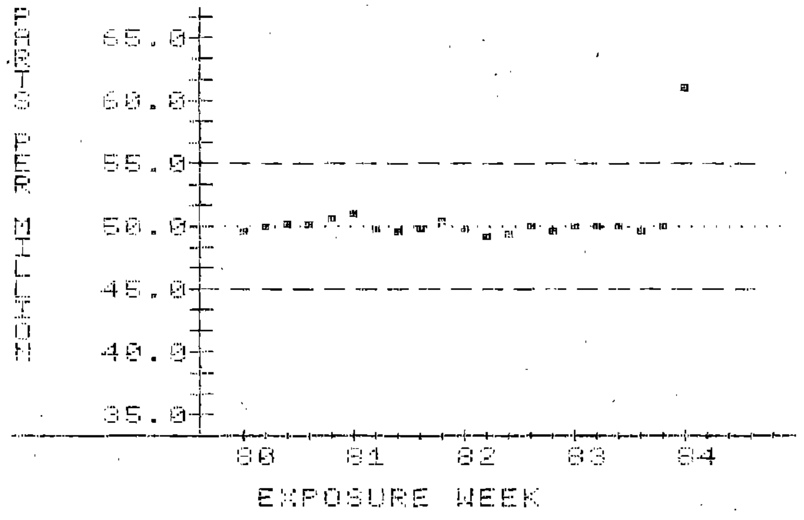
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
03/01/84	75	357	50.4 +/- .96(14)	48.6	52.1
03/02/84	75	358	51.2 +/- .80(15)	50.2	53.1
WEEK SUMMARY			AV = 50.8 n = 2	48.6	53.1
03/05/84	76	359	50.0 +/- .71(14)	49.4	51.8
03/06/84	76	360	49.6 +/- 1.42(14)	45.0	51.3
03/07/84	76	361	50.5 +/- .39(14)	49.9	51.1
03/08/84	76	362	50.7 +/- 1.56(15)	48.4	53.1
03/09/84	76	363	49.9 +/- .93(15)	47.9	51.3
WEEK SUMMARY			AV = 50.1 n = 5	45.0	53.1
03/12/84	77	364	50.1 +/- 1.08(14)	47.1	51.8
03/13/84	77	365	49.9 +/- .98(14)	47.7	51.6
03/14/84	77	366	50.1 +/- 1.76(15)	46.1	52.2
03/15/84	77	367	49.4 +/- 1.92(4)	48.1	52.2
03/16/84	77	368	49.4 +/- .60(14)	47.8	50.1
WEEK SUMMARY			AV = 49.8 n = 5	46.1	52.2
03/19/84	78	369	50.2 +/- 2.18(14)	47.3	54.0
03/20/84	78	370	49.9 +/- 1.62(14)	46.2	51.9
03/21/84	78	371	50.0 +/- 1.39(13)	47.7	52.5
03/22/84	78	372	50.2 +/- .60(14)	48.9	51.0
03/23/84	78	373	50.1 +/- 1.41(14)	45.3	50.9
WEEK SUMMARY			AV = 50.1 n = 5	45.3	54.0
03/26/84	79	374	49.7 +/- 1.54(14)	47.2	52.8
03/27/84	79	375	49.9 +/- 2.02(15)	46.0	53.0
03/28/84	79	376	50.1 +/- .64(14)	48.2	50.6
03/29/84	79	377	49.8 +/- .96(15)	48.5	52.4
03/30/84	79	378	49.1 +/- 1.15(14)	47.4	51.0
WEEK SUMMARY			AV = 49.7 n = 5	46.0	53.0
REPORT SUMMARY			AV = 50.0 n = 22	45.0	54.0



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/ET
7452B: ETHYLENE DICHLORIDE 50 PPM
WEEK 80 THRU 84

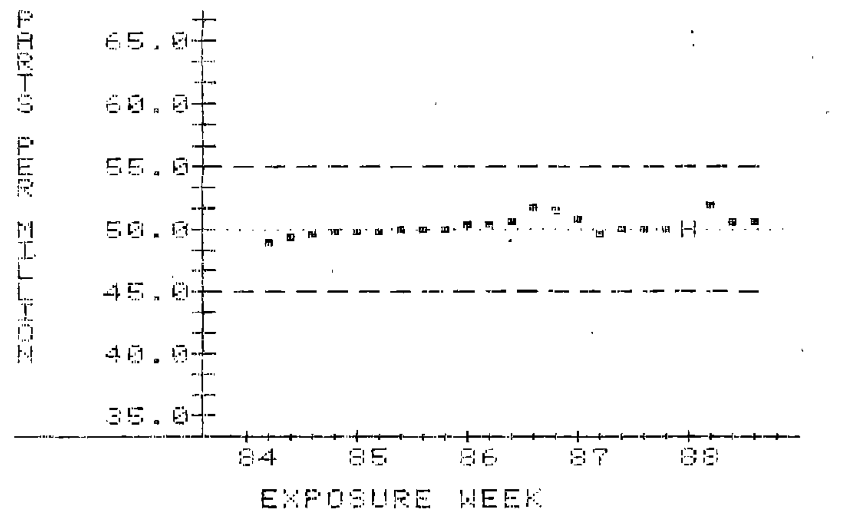
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
04/02/84	80	379	49.7 +/- 1.52(15)	48.1	54.2
04/03/84	80	380	50.1 +/- 1.05(13)	48.1	51.8
04/04/84	80	381	50.3 +/- .83(15)	47.8	51.5
04/05/84	80	382	50.3 +/- 1.35(15)	48.0	52.2
04/06/84	80	383	50.6 +/- 1.40(15)	46.8	52.7
WEEK SUMMARY			AV = 50.2 n = 5	46.8	54.2
04/09/84	81	384	51.0 +/- .89(15)	48.9	52.3
04/10/84	81	385	49.9 +/- 1.37(14)	46.1	51.6
04/11/84	81	386	49.7 +/- .75(14)	48.6	51.2
04/12/84	81	387	49.9 +/- 1.40(15)	45.6	51.5
04/13/84	81	388	50.4 +/- .38(15)	49.7	51.3
WEEK SUMMARY			AV = 50.2 n = 5	45.6	52.3
04/16/84	82	389	49.9 +/- 1.24(14)	47.2	52.0
04/17/84	82	390	49.3 +/- 1.42(15)	45.2	51.4
04/18/84	82	391	49.5 +/- 1.41(14)	46.4	51.8
04/19/84	82	392	50.0 +/- 1.75(15)	47.0	53.7
04/20/84	82	393	49.6 +/- .89(13)	47.4	50.6
WEEK SUMMARY			AV = 49.7 n = 5	45.2	53.7
04/23/84	83	394	50.1 +/- .95(13)	48.0	52.2
04/24/84	83	395	50.1 +/- 1.11(14)	46.9	51.1
04/25/84	83	396	50.1 +/- 1.30(14)	47.1	51.4
04/26/84	83	397	49.6 +/- .81(15)	48.4	51.0
04/27/84	83	398	50.1 +/- .53(14)	48.9	51.0
WEEK SUMMARY			AV = 50.0 n = 5	46.9	52.2
04/30/84	84	399	61.0 +/- 1.36(14)	57.4	63.1
WEEK SUMMARY			AV = 61.0 n = 1	57.4	63.1
REPORT SUMMARY			AV = 50.5 n = 21	45.2	63.1



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS --- EDC/ET
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 84 THRU 88

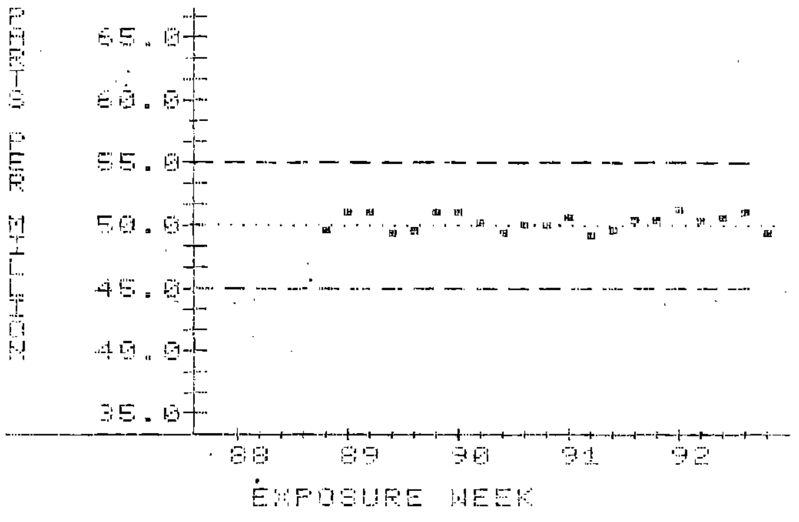
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
05/01/84	84	400	49.0 +/- 1.35(12)	46.7	51.4
05/02/84	84	401	49.5 +/- 1.84(14)	45.2	51.3
05/03/84	84	402	49.7 +/- .82(13)	47.3	50.5
05/04/84	84	403	49.8 +/- 1.48(14)	47.1	51.8
WEEK SUMMARY			AV = 49.5 n = 4	45.2	51.8
05/07/84	85	404	49.8 +/- 1.10(14)	48.1	52.0
05/08/84	85	405	49.9 +/- 1.58(13)	46.6	52.6
05/09/84	85	406	50.1 +/- .79(11)	49.1	51.3
05/10/84	85	407	50.1 +/- 1.93(15)	47.2	54.2
05/11/84	85	408	50.0 +/- .92(12)	48.9	52.4
WEEK SUMMARY			AV = 50.0 n = 5	46.6	54.2
05/14/84	86	409	50.5 +/- 2.97(15)	42.9	55.3
05/15/84	86	410	50.5 +/- 1.59(14)	47.1	54.5
05/16/84	86	411	50.6 +/- 1.08(15)	48.5	52.4
05/17/84	86	412	51.6 +/- 1.02(15)	50.3	53.4
05/18/84	86	413	51.4 +/- 2.02(14)	47.1	54.0
WEEK SUMMARY			AV = 50.9 n = 5	42.9	55.3
05/21/84	87	414	50.8 +/- 1.45(15)	46.2	52.7
05/22/84	87	415	49.6 +/- .61(14)	48.9	51.2
05/23/84	87	416	50.0 +/- 1.41(14)	46.0	51.7
05/24/84	87	417	50.1 +/- .78(10)	49.2	51.3
05/25/84	87	418	50.0 +/- 1.14(13)	48.2	51.2
WEEK SUMMARY			AV = 50.1 n = 5	46.0	52.7
05/28/84	88		HOLIDAY		
05/29/84	88	419	51.8 +/- 2.33(15)	50.0	58.7
05/30/84	88	420	50.6 +/- 1.38(13)	46.6	52.3
05/31/84	88	421	50.7 +/- 1.11(14)	47.4	51.8
WEEK SUMMARY			AV = 51.0 n = 3	46.6	58.7
REPORT SUMMARY			AV = 50.3 n = 22	42.9	58.7



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/ET
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 88 THRU 92

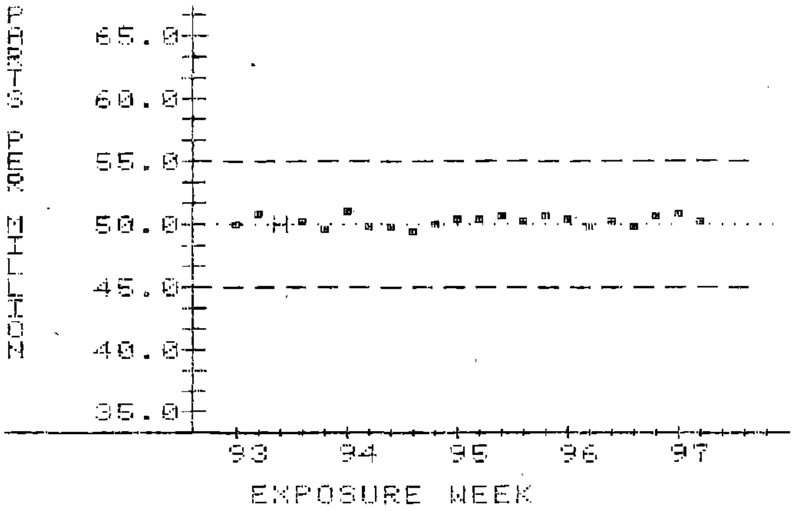
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
06/01/84	88	422	49.7 +/- 1.84(14)	44.8	52.2
WEEK SUMMARY			AV = 49.7 n = 1	44.8	52.2
06/04/84	89	423	51.1 +/- 1.79(13)	45.9	52.7
06/05/84	89	424	51.0 +/- .91(14)	49.3	52.4
06/06/84	89	425	49.5 +/- 1.20(13)	47.4	50.8
06/07/84	89	426	49.6 +/- 1.05(13)	47.2	51.7
06/08/84	89	427	51.1 +/- 1.10(13)	49.7	53.9
WEEK SUMMARY			AV = 50.5 n = 5	45.9	53.9
06/11/84	90	428	51.0 +/- .90(15)	49.3	52.4
06/12/84	90	429	50.3 +/- 1.55(12)	48.4	53.8
06/13/84	90	430	49.4 +/- 3.41(15)	41.1	53.6
06/14/84	90	431	50.0 +/- .36(12)	49.4	50.6
06/15/84	90	432	50.0 +/- .53(15)	48.9	50.8
WEEK SUMMARY			AV = 50.1 n = 5	41.1	53.8
06/18/84	91	433	50.6 +/- 2.66(15)	46.2	54.6
06/19/84	91	434	49.3 +/- .80(14)	48.2	50.5
06/20/84	91	435	49.7 +/- 1.10(15)	46.5	50.9
06/21/84	91	436	50.4 +/- .84(15)	48.1	51.0
06/22/84	91	437	50.5 +/- 1.36(15)	47.5	52.1
WEEK SUMMARY			AV = 50.1 n = 5	46.2	54.6
06/25/84	92	438	51.3 +/- 2.74(12)	44.1	55.1
06/26/84	92	439	50.5 +/- 3.10(15)	41.1	55.5
06/27/84	92	440	50.6 +/- .62(15)	49.9	51.7
06/28/84	92	441	51.1 +/- 2.36(15)	43.7	53.6
06/29/84	92	442	49.5 +/- 2.85(12)	43.6	53.3
WEEK SUMMARY			AV = 50.6 n = 5	41.1	55.5
REPORT SUMMARY			AV = 50.3 n = 21	41.1	55.5



H - HOLIDAY   N - OTHER   O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/ET
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 93 THRU 97

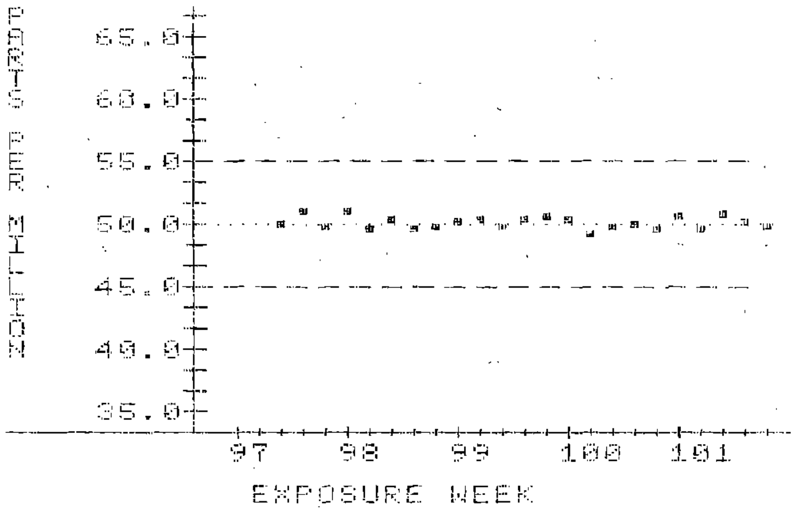
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
07/02/84	93	443	50.1 +/- .56(13)	49.4	51.4
07/03/84	93	444	50.9 +/- 2.59(15)	42.9	53.9
07/04/84	93		HOLIDAY		
07/05/84	93	445	50.3 +/- 2.68(14)	43.7	52.5
07/06/84	93	446	49.6 +/- 2.00(15)	46.6	56.0
WEEK SUMMARY			AV = 50.2 n = 4	42.9	56.0
07/09/84	94	447	51.1 +/- 1.81(12)	47.7	53.7
07/10/84	94	448	49.9 +/- 4.22(14)	40.5	56.8
07/11/84	94	449	49.8 +/- 2.03(13)	43.4	51.5
07/12/84	94	450	49.5 +/- 2.36(14)	43.1	52.0
07/13/84	94	451	50.0 +/- 1.35(15)	47.2	51.5
WEEK SUMMARY			AV = 50.1 n = 5	40.5	56.8
07/16/84	95	452	50.4 +/- 1.01(14)	49.5	52.4
07/17/84	95	453	50.5 +/- 1.85(14)	46.5	53.7
07/18/84	95	454	50.6 +/- .94(13)	48.7	51.9
07/19/84	95	455	50.2 +/- .61(14)	49.4	51.3
07/20/84	95	456	50.6 +/- 1.33(14)	48.2	52.5
WEEK SUMMARY			AV = 50.5 n = 5	46.5	53.7
07/23/84	96	457	50.5 +/- .57(14)	49.5	51.7
07/24/84	96	458	49.8 +/- 1.14(15)	45.9	50.5
07/25/84	96	459	50.2 +/- 1.49(14)	46.0	51.9
07/26/84	96	460	49.8 +/- 2.14(14)	44.0	51.7
07/27/84	96	461	50.6 +/- 1.18(15)	47.7	52.0
WEEK SUMMARY			AV = 50.2 n = 5	44.0	52.0
07/30/84	97	462	50.8 +/- 1.24(13)	49.4	52.5
07/31/84	97	463	50.3 +/- 2.78(14)	42.9	55.0
WEEK SUMMARY			AV = 50.6 n = 2	42.9	55.0
REPORT SUMMARY			AV = 50.3 n = 21	40.5	56.8



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/ET
74528: ETHYLENE DICHLORIDE 50 PPM
WEEK 97 THRU 101

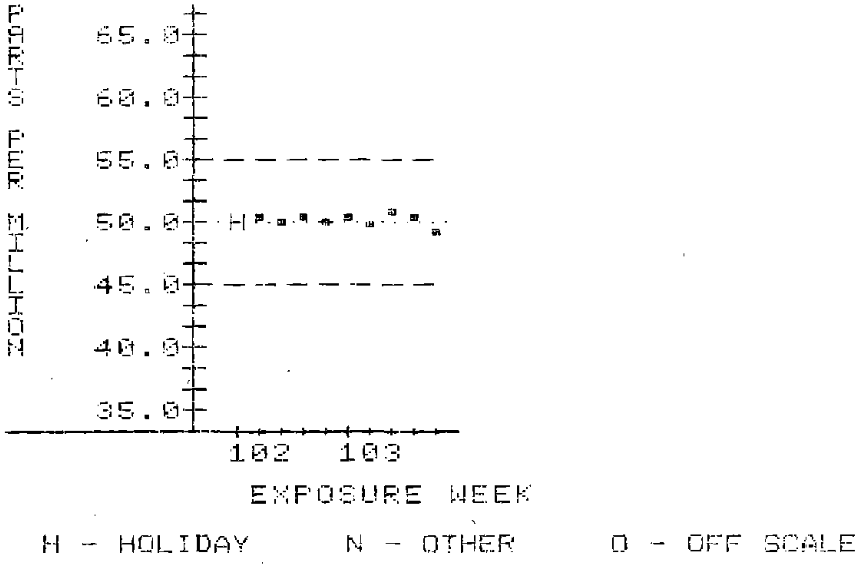
DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
08/01/84	97	464	50.1 +/- .62(15)	49.1	50.9
08/02/84	97	465	51.0 +/- 1.60(15)	49.6	55.0
08/03/84	97	466	49.8 +/- .89(15)	48.3	51.1
WEEK SUMMARY			AV = 50.3 n = 3	48.3	55.0
08/06/84	98	467	51.1 +/- 2.13(14)	49.2	56.7
08/07/84	98	468	49.7 +/- .84(15)	48.6	51.7
08/08/84	98	469	50.5 +/- .84(14)	48.6	51.4
08/09/84	98	470	49.6 +/- .46(14)	49.0	50.4
08/10/84	98	471	49.9 +/- 1.89(15)	45.0	52.3
WEEK SUMMARY			AV = 50.2 n = 5	45.0	56.7
08/13/84	99	472	50.2 +/- 1.69(15)	46.9	52.8
08/14/84	99	473	50.5 +/- 1.09(14)	48.3	52.3
08/15/84	99	474	49.8 +/- 1.58(15)	46.7	52.4
08/16/84	99	475	50.5 +/- .75(14)	48.3	51.5
08/17/84	99	476	50.7 +/- 1.62(14)	47.4	54.5
WEEK SUMMARY			AV = 50.3 n = 5	46.7	54.5
08/20/84	100	477	50.4 +/- 1.27(14)	48.7	53.8
08/21/84	100	478	49.3 +/- .70(15)	47.1	49.9
08/22/84	100	479	49.8 +/- .68(15)	48.5	51.0
08/23/84	100	480	50.0 +/- .76(15)	48.4	50.9
08/24/84	100	481	49.7 +/- 1.16(14)	47.6	52.7
WEEK SUMMARY			AV = 49.8 n = 5	47.1	53.8
08/27/84	101	482	50.7 +/- 1.15(15)	48.2	52.7
08/28/84	101	483	49.6 +/- .89(14)	48.1	51.7
08/29/84	101	484	50.8 +/- 2.95(14)	48.0	59.8
08/30/84	101	485	50.2 +/- 1.46(15)	45.2	51.6
08/31/84	101	486	49.8 +/- 1.33(15)	47.6	53.2
WEEK SUMMARY			AV = 50.2 n = 5	45.2	59.8
REPORT SUMMARY			AV = 50.2 n = 23	45.0	59.8



H - HOLIDAY N - OTHER O - OFF SCALE

CHAMBER CONCENTRATIONS -- EDC/ET
7452B: ETHYLENE DICHLORIDE 50 PPM
WEEK 102 THRU 103

DATE	EXPOSURE WEEK	EXPOSURE DAY	MEAN +/- S.D. (n)	MINIMUM READING	MAXIMUM READING
09/03/84	102		HOLIDAY		
09/04/84	102	487	50.4 +/- .98(14)	48.3	52.0
09/05/84	102	488	50.1 +/- .67(15)	48.3	51.0
09/06/84	102	489	50.5 +/- .79(15)	49.2	51.8
09/07/84	102	490	50.1 +/- .51(15)	49.4	51.2
WEEK SUMMARY			AV = 50.3 n = 4	48.3	52.0
09/10/84	103	491	50.5 +/- 1.74(15)	47.7	54.5
09/11/84	103	492	49.8 +/- 1.67(15)	47.9	53.5
09/12/84	103	493	50.8 +/- 1.23(15)	48.2	52.1
09/13/84	103	494	50.4 +/- .69(14)	48.5	51.5
09/14/84	103	495	49.3 +/- .91(15)	46.3	50.1
WEEK SUMMARY			AV = 50.2 n = 5	46.3	54.5
REPORT SUMMARY			AV = 50.2 n = 9	46.3	54.5



APPENDIX 6

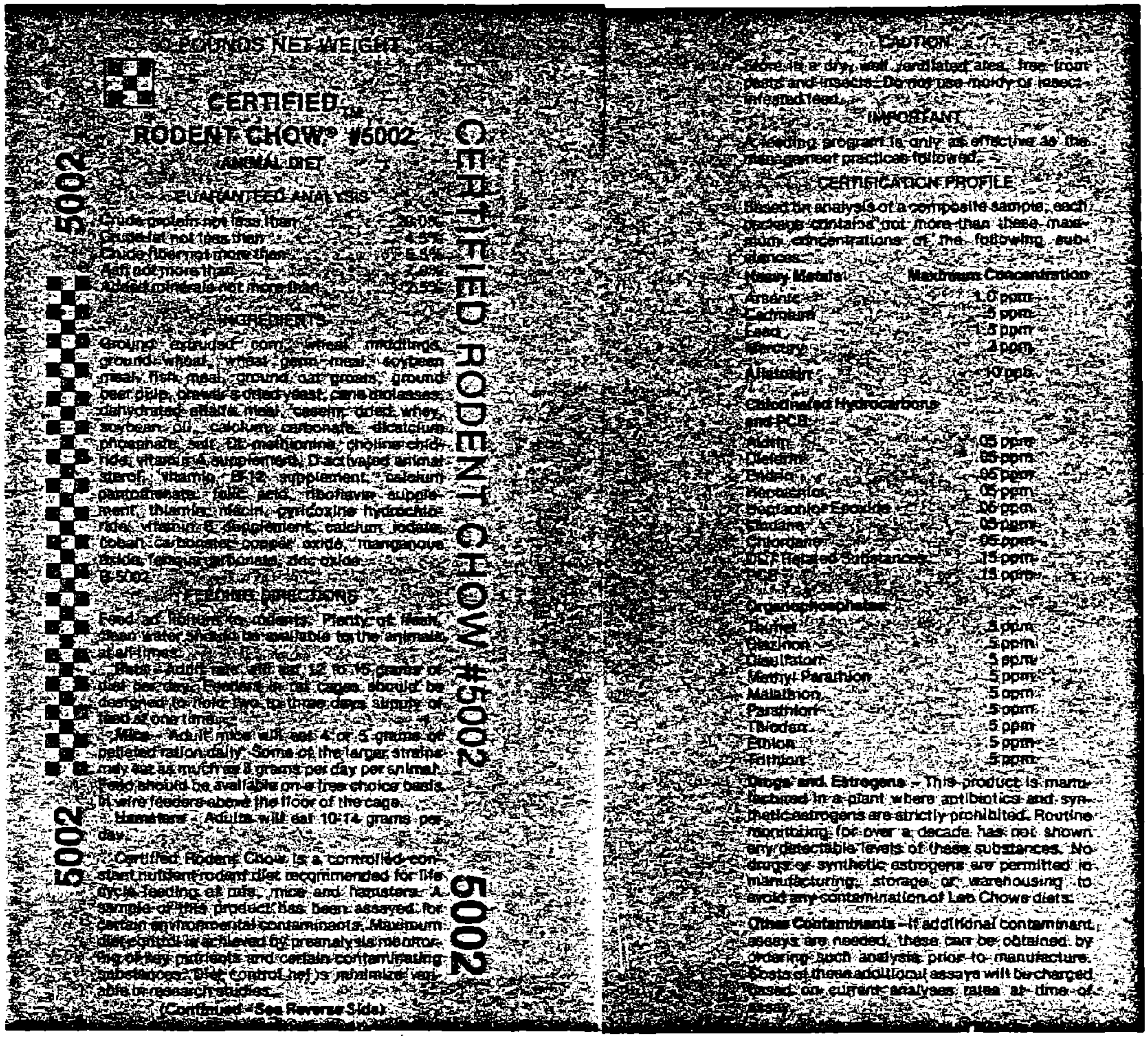
ANIMAL FEED INFORMATION

- Sample Feed Label

- Lot Numbers/Milling Dates:

  Jul 20 82 2F
  Jul 20 82 2A
  Jan 7 83 1D
  Jan 7 83 1K
  Jan 7 83 1A
  Jan 21 83 1A
  May 5 83 2M
  May 5 83 2N
  Jul 14 83 1E
  Oct 13 83 2D
  Dec 29 83 2A
  Jan 20 84 2B
  May 3 84 1A

- Basic Residues Analyses



50 POUNDS NET WEIGHT

CERTIFIED

RODENT CHOW® #5002

ANIMAL DIET

GUARANTEED ANALYSIS

Crude protein not less than	20.0%
Crude fat not less than	4.5%
Crude fiber not more than	5.5%
Ash not more than	7.0%
Added minerals not more than	2.5%

INGREDIENTS

Ground extruded corn, wheat middlings, ground wheat, wheat germ meal, soybean meal, fish meal, ground oat groats, ground beet pulp, brewers dried yeast, cane molasses, dehydrated alfalfa meal, casein, dried whey, soybean oil, calcium carbonate, dicalcium phosphate, salt, DL-methionine, choline chloride, vitamin A supplement, D-activated animal sterol, vitamin B-12 supplement, calcium pantothenate, folic acid, riboflavin supplement, thiamin, niacin, pyridoxine hydrochloride, vitamin E supplement, calcium iodate, cobalt carbonate, copper oxide, manganous oxide, ferrous carbonate, zinc oxide.

B-5002

FEEDING DIRECTIONS

Feed ad libitum to rodents. Plenty of fresh, clean water should be available to the animals at all times.

Rats – Adult rats will eat 12 to 15 grams of diet per day. Feeders in rat cages should be designed to hold two to three days supply of feed at one time.

Mice – Adult mice will eat 4 or 5 grams of pelleted ration daily. Some of the larger strains may eat as much as 8 grams per day per animal. Feed should be available on a free choice basis in wire feeders above the floor of the cage.

Hamsters – Adults will eat 10-14 grams per day.

Certified Rodent Chow is a controlled constant nutrient rodent diet recommended for life cycle feeding of rats, mice and hamsters. A sample of this product has been assayed for certain environmental contaminants. Maximum diet control is achieved by preanalysis monitoring of key nutrients and certain contaminating substances. Diet control helps minimize variables in research studies.

(Continued – See Reverse Side)

5002

5002

CERTIFIED RODENT CHOW #5002

5002

CAUTION

Store in a dry, well ventilated area, free from pests and insects. Do not use moldy or insect infested feed.

IMPORTANT

A feeding program is only as effective as the management practices followed.

CERTIFICATION PROFILE

Based on analysis of a composite sample, each package contains not more than these maximum concentrations of the following substances.

Heavy Metals	**Maximum Concentration**
Arsenic	1.0 ppm
Cadmium	.5 ppm
Lead	1.5 ppm
Mercury	.2 ppm
Aflatoxin	10 ppb
Chlorinated Hydrocarbons and PCB	
Aldrin	.05 ppm
Dieldrin	.05 ppm
Endrin	.05 ppm
Heptachlor	.05 ppm
Heptachlor Epoxide	.05 ppm
Lindane	.05 ppm
Chlordane	.05 ppm
DDT Related Substances	.15 ppm
PCB	.15 ppm
Organophosphates	
Ronnel	.5 ppm
Diazinon	.5 ppm
Disulfoton	.5 ppm
Methyl Parathion	.5 ppm
Malathion	.5 ppm
Parathion	.5 ppm
Thiodan	.5 ppm
Ethion	.5 ppm
Trithion	.5 ppm

Drugs and Estrogens – This product is manufactured in a plant where antibiotics and synthetic estrogens are strictly prohibited. Routine monitoring for over a decade has not shown any detectable levels of these substances. No drugs or synthetic estrogens are permitted in manufacturing, storage, or warehousing to avoid any contamination of Lab Chows diets.

Other Contaminants – If additional contaminant assays are needed, these can be obtained by ordering such analysis prior to manufacture. Costs of these additional assays will be charged based on current analyses rates at time of assay.

Sample Feed Label

Ralston Purina
Company
Analytical Services
Checkerboard Square
St. Louis, Missouri 63188

TO RICHMOND, IN

CC RICHMOND, IND.
D.C.SHELTON, 3RS
J.R.SNYDER, 2RS

LAB NO 162408 ENTERED 07/23/82 REPORTED 08/04/82 RHI 5002

CERTIFIED RODENT CHOW MEAL
LOT NUMBER JUL 20 82 2F

ASSAY	ANALYSIS	UNITS	LOW-LIMIT	HIGH-LIMIT
PROTEIN (N X 6.25)	21.4	%	20.0	
FAT (ACID HYDRO.)	7.40	%	4.50	
FIBER (CRUDE)	5.06	%		5.50
ARSENIC	0.310	PPM		1.00
CADMIUM	0.0946	PPM		0.500
CALCIUM	0.931	%		
LEAD	0.227	PPM		1.50
MERCURY	LESS THAN 0.05 PPM			
PHOSPHORUS	0.782	%		
SELENIUM	0.321	PPM		
AFLATOXIN	TOTAL:LESS THAN 10 PPB			

ORGANOPHOSPHATE PEST

	(PPM)		(PPM)
THIMET.............	LESS THAN 0.02	DIAZINON...........	LESS THAN 0.02
DISULFOTON.........	LESS THAN 0.02	METHYL PARATHION...	LESS THAN 0.02
MALATHION..........	0.16	PARATHION..........	LESS THAN 0.02
THIODAN............	LESS THAN 0.02	ETHION.............	LESS THAN 0.02
TRITHION...........	LESS THAN 0.02		

PESTICIDE & PCB

	(PPM)		(PPM)
ALDRIN.............	LESS THAN 0.02	DIELDRIN...........	LESS THAN 0.02
ENDRIN.............	LESS THAN 0.02	HEPTACHLOR.........	LESS THAN 0.02
HEPTACHLOR EPOXIDE.	LESS THAN 0.02	LINDANE............	LESS THAN 0.02

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RT LAB NUMBER 162408 PAGE 2

CERTIFIED RODENT CHOW MEAL
LOT NUMBER JUL 20 82 2F

PESTICIDE & PCB (CONTINUED)

DDT................	LESS THAN 0.02	DDE................	LESS THAN 0.02
CHLORDANE..........	LESS THAN 0.02	PCB................	LESS THAN 0.15

FOR ADDITIONAL INFORMATION, PLEASE CONTACT:
(1) FOR ASSAY METHODOLOGY - CHARLIE SCHROEDER 314-982-2383
(2) FOR NUTRITIONAL INTERPRETATION-DR.D.C.SHELTON 314-982-3513
(3) ALL OTHER QUESTIONS-RICHMOND, IN., MANUFACTURING PLANT 317-962-9561

SIGNED C R Schroeder DATE 08/04/82

BY AND FOR ANALYTICAL SERVICES

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LAB NO 162405 ENTERED 07/23/82 REPORTED 08/04/82 RHI 5002

CERTIFIED RODENT CHOW MEAL
LOT NUMBER JUL 20 82 2A

ASSAY	ANALYSIS	UNITS	LOW-LIMIT	HIGH-LIMIT
PROTEIN (N X 6.25)	21.8	%	20.0	
FAT (ACID HYDRO.)	6.79	%	4.50	
FIBER (CRUDE)	4.77	%		5.50
ARSENIC	0.345	PPM		1.00
CADMIUM	0.122	PPM		0.500
CALCIUM	0.931	%		
LEAD	0.227	PPM		1.50
MERCURY	LESS THAN 0.05 PPM			
PHOSPHORUS	0.785	%		
SELENIUM	0.169	PPM		
AFLATOXIN	TOTAL:LESS THAN 10 PPB			

ORGANOPHOSPHATE PEST

	(PPM)		(PPM)
THIMET.............	LESS THAN 0.02	DIAZINON...........	LESS THAN 0.02
DISULFOTON.........	LESS THAN 0.02	METHYL PARATHION...	LESS THAN 0.02
MALATHION..........	0.14	PARATHION..........	LESS THAN 0.02
THIODAN............	LESS THAN 0.02	ETHION.............	LESS THAN 0.02
TRITHION...........	LESS THAN 0.02		

PESTICIDE & PCB

	(PPM)		(PPM)
ALDRIN.............	LESS THAN 0.02	DIELDRIN...........	LESS THAN 0.02
ENDRIN.............	LESS THAN 0.02	HEPTACHLOR.........	LESS THAN 0.02
HEPTACHLOR EPOXIDE.	LESS THAN 0.02	LINDANE............	LESS THAN 0.02

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PT LAB NUMBER 162405

CERTIFIED RODENT CHOW MEAL
LOT NUMBER JUL 20 82 2A

PESTICIDE & PCB (CONTINUED)

DDT.................	LESS THAN 0.02	DDE.................	LESS THAN 0.02
CHLORDANE..........	LESS THAN 0.02	PCB.................	LESS THAN 0.15

FOR ADDITIONAL INFORMATION, PLEASE CONTACT:
(1) FOR ASSAY METHODOLOGY - CHARLIE SCHROEDER 314-982-2383
(2) FOR NUTRITIONAL INTERPRETATION-DR.D.C.SHELTON 314-982-3513
(3) ALL OTHER QUESTIONS-RICHMOND, IN., MANUFACTURING PLANT 317-962-9561

SIGNED C R Schroeder DATE 08/04/82

BY AND FOR ANALYTICAL SERVICES

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LAB NO 195825 ENTERED 01/12/83 REPORTED 01/19/83 RHI 5002

CERTIFIED RODENT CHOW MEAL
LOT NUMBER JAN 07 83 1D

ASSAY	ANALYSIS	UNITS	LOW-LIMIT	HIGH-LIMIT
PROTEIN (N X 6.25)	20.5	%	20.0	
FAT (ACID HYDRO.)	6.15	%	4.50	
FIBER (CRUDE)	4.99	%		5.50
ARSENIC	0.233	PPM		1.00
CADMIUM	0.211	PPM		0.500
CALCIUM	0.748	%		
LEAD	0.639	PPM		1.50
MERCURY	LESS THAN 0.05 PPM			
PHOSPHORUS	0.757	%		
SELENIUM	0.219	PPM		
AFLATOXIN	TOTAL:LESS THAN 10 PPB			

ORGANOPHOSPHATE PEST

	(PPM)		(PPM)
THIMET.............	LESS THAN 0.02	DIAZINON...........	LESS THAN 0.02
DISULFOTON.........	LESS THAN 0.02	METHYL PARATHION...	LESS THAN 0.02
MALATHION..........	0.21	PARATHION..........	LESS THAN 0.02
THIODAN............	LESS THAN 0.02	ETHION.............	LESS THAN 0.02
TRITHION...........	LESS THAN 0.02		

PESTICIDE & PCB

	(PPM)		(PPM)
ALDRIN.............	LESS THAN 0.02	DIELDRIN...........	LESS THAN 0.02
ENDRIN.............	LESS THAN 0.02	HEPTACHLOR.........	LESS THAN 0.02
HEPTACHLOR EPOXIDE.	LESS THAN 0.02	LINDANE............	LESS THAN 0.02

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RT LAB NUMBER 195825

CERTIFIED RODENT CHOW MEAL
LOT NUMBER JAN 07 83 1D

PESTICIDE & PCB (CONTINUED)

DDT................	LESS THAN 0.02	DDE................	LESS THAN 0.02
CHLORDANE..........	LESS THAN 0.02	PCB................	LESS THAN 0.15

FOR ADDITIONAL INFORMATION, PLEASE CONTACT:
(1) FOR ASSAY METHODOLOGY - JIM LANGE 314-982-3598
(2) FOR NUTRITIONAL INTERPRETATION-DR.D.C.SHELTON 314-982-3513
(3) ALL OTHER QUESTIONS-RICHMOND, IN., MANUFACTURING PLANT 317-962-9561

SIGNED James R. Lange DATE 01/19/83
BY AND FOR ANALYTICAL SERVICES

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LAB NO 195425 ENTERED 01/11/83 REPORTED 01/19/83 RHI 5002

CERTIFIED RODENT CHOW MEAL
LOT NUMBER JAN 07 83 1K

ASSAY	ANALYSIS	UNITS	LOW-LIMIT	HIGH-LIMIT
PROTEIN (N X 6.25)	20.7	%	20.0	
FAT (ACID HYDRO.)	6.32	%	4.50	
FIBER (CRUDE)	5.05	%		5.50
ARSENIC	0.221	PPM		1.00
CADMIUM	0.225	PPM		0.500
CALCIUM	0.883	%		
LEAD	0.410	PPM		1.50
MERCURY	LESS THAN 0.05 PPM			
PHOSPHORUS	0.763	%		
SELENIUM	0.238	PPM		
AFLATOXIN	TOTAL:LESS THAN 10 PPB			

ORGANOPHOSPHATE PEST

	(PPM)		(PPM)
THIMET	LESS THAN 0.02	DIAZINON	LESS THAN 0.02
DISULFOTON	LESS THAN 0.02	METHYL PARATHION	LESS THAN 0.02
MALATHION	0.20	PARATHION	LESS THAN 0.02
THIODAN	LESS THAN 0.02	ETHION	LESS THAN 0.02
TRITHION	LESS THAN 0.02		

PESTICIDE & PCB

	(PPM)		(PPM)
ALDRIN	LESS THAN 0.02	DIELDRIN	LESS THAN 0.02
ENDRIN	LESS THAN 0.02	HEPTACHLOR	LESS THAN 0.02
HEPTACHLOR EPOXIDE	LESS THAN 0.02	LINDANE	LESS THAN 0.02

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CERTIFIED RODENT CHOW MEAL
LOT NUMBER JAN 07 83 1K

PESTICIDE & PCB (CONTINUED)

DDT	LESS THAN 0.02	DDE	LESS THAN 0.02
CHLORDANE	LESS THAN 0.02	PCB	LESS THAN 0.15

FOR ADDITIONAL INFORMATION, PLEASE CONTACT:
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(3) ALL OTHER QUESTIONS-RICHMOND, IN., MANUFACTURING PLANT 317-962-9561

SIGNED James R. Lange DATE 01/19/83
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TO RICHMOND, IN

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LAB NO 195826 ENTERED 01/12/83 REPORTED 01/20/83 RHI 5002

CERTIFIED RODENT CHOW MEAL
LOT NUMBER JAN 07 83 1A

ASSAY	ANALYSIS	UNITS	LOW-LIMIT	HIGH-LIMIT
PROTEIN (N X 6.25)	21.1	%	20.0	
FAT (ACID HYDRO.)	6.18	%	4.50	
FIBER (CRUDE)	5.10	%		5.50
ARSENIC	0.211	PPM		1.00
CADMIUM	0.211	PPM		0.500
CALCIUM	0.947	%		
LEAD	0.552	PPM		1.50
MERCURY	LESS THAN 0.05 PPM			
PHOSPHORUS	0.818	%		
SELENIUM	0.234	PPM		
AFLATOXIN	TOTAL:LESS THAN 10 PPB			

ORGANOPHOSPHATE PEST

	(PPM)		(PPM)
THIMET.............	LESS THAN 0.02	DIAZINON...........	LESS THAN 0.02
DISULFOTON.........	LESS THAN 0.02	METHYL PARATHION...	LESS THAN 0.02
MALATHION..........	0.20	PARATHION..........	LESS THAN 0.02
THIODAN............	LESS THAN 0.02	ETHION.............	LESS THAN 0.02
TRITHION...........	LESS THAN 0.02		

PESTICIDE & PCB

	(PPM)		(PPM)
ALDRIN.............	LESS THAN 0.02	DIELDRIN...........	LESS THAN 0.02
ENDRIN.............	LESS THAN 0.02	HEPTACHLOR.........	LESS THAN 0.02
HEPTACHLOR EPOXIDE.	LESS THAN 0.02	LINDANE............	LESS THAN 0.02

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T LAB NUMBER 195826 PAGE 2

CERTIFIED RODENT CHOW MEAL
LOT NUMBER JAN 07 83 1A

PESTICIDE & PCB (CONTINUED)

DDT................	LESS THAN 0.02	DDE................	LESS THAN 0.02
CHLORDANE..........	LESS THAN 0.02	PCB................	LESS THAN 0.15

FOR ADDITIONAL INFORMATION, PLEASE CONTACT:
(1) FOR ASSAY METHODOLOGY - JIM LANGE 314-982-3598
(2) FOR NUTRITIONAL INTERPRETATION-DR.D.C.SHELTON 314-982-3513
(3) ALL OTHER QUESTIONS-RICHMOND, IN., MANUFACTURING PLANT 317-962-9561

SIGNED James R. Lange DATE 01/20/83
BY AND FOR ANALYTICAL SERVICES

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TO RICHMOND, IN

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D.C.SHELTON, 3RS
J.R.SNYDER, 2RS

LAB NO 198070 ENTERED 01/25/83 REPORTED 02/02/83 RHI 5002

CERTIFIED RODENT CHOW MEAL
LOT NUMBER JAN 21 83 1A

ASSAY	ANALYSIS	UNITS	LOW-LIMIT	HIGH-LIMIT
PROTEIN (N X 6.25)	20.4	%	20.0	
FAT (ACID HYDRO.)	5.98	%	4.50	
FIBER (CRUDE)	5.19	%		5.50
ARSENIC	0.207	PPM		1.00
CADMIUM	0.174	PPM		0.500
CALCIUM	0.849	%		
LEAD	0.352	PPM		1.50
MERCURY	LESS THAN 0.05 PPM			
PHOSPHORUS	0.744	%		
SELENIUM	0.197	PPM		
AFLATOXIN	TOTAL:LESS THAN 10 PPB			

ORGANOPHOSPHATE PEST

	(PPM)		(PPM)
THIMET.............	LESS THAN 0.02	DIAZINON...........	LESS THAN 0.02
DISULFOTON.........	LESS THAN 0.02	METHYL PARATHION...	LESS THAN 0.02
MALATHION..........	0.25	PARATHION..........	LESS THAN 0.02
THIODAN............	LESS THAN 0.02	ETHION.............	LESS THAN 0.02
TRITHION...........	LESS THAN 0.02		

PESTICIDE & PCB

	(PPM)		(PPM)
ALDRIN.............	LESS THAN 0.02	DIELDRIN...........	LESS THAN 0.02
ENDRIN.............	LESS THAN 0.02	HEPTACHLOR.........	LESS THAN 0.02
HEPTACHLOR EPOXIDE.	LESS THAN 0.02	LINDANE............	LESS THAN 0.02

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RT LAB NUMBER 198070

CERTIFIED RODENT CHOW MEAL
LOT NUMBER JAN 21 83 1A

PESTICIDE & PCB (CONTINUED)

DDT................	LESS THAN 0.02	DDE................	LESS THAN 0.02
CHLORDANE..........	LESS THAN 0.02	PCB................	LESS THAN 0.15

FOR ADDITIONAL INFORMATION, PLEASE CONTACT:
(1) FOR ASSAY METHODOLOGY - JIM LANGE 314-982-3598
(2) FOR NUTRITIONAL INTERPRETATION-DR.D.C.SHELTON 314-982-3513
(3) ALL OTHER QUESTIONS-RICHMOND, IN., MANUFACTURING PLANT 317-962-9561

SIGNED James R. Lange DATE 02/02/83
BY AND FOR ANALYTICAL SERVICES

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TO RICHMOND, IN

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J.R.SNYDER, 2RS

LAB NO 218062 ENTERED 05/10/83 REPORTED 05/18/83 RHI 5002

CERTIFIED RODENT CHOW MEAL
LOT NUMBER MAY 05 83 2M

ASSAY	ANALYSIS	UNITS	LOW-LIMIT	HIGH-LIMIT
PROTEIN (N X 6.25)	21.0	%	20.0	
FAT (ACID HYDRO.)	6.15	%	4.50	
FIBER (CRUDE)	4.21	%		5.50
ARSENIC	0.334	PPM		1.00
CADMIUM	0.221	PPM		0.500
CALCIUM	0.835	%		
LEAD	0.420	PPM		1.50
MERCURY	LESS THAN .05	PPM		
PHOSPHORUS	0.675	%		
SELENIUM	0.243	PPM		

ORGANOPHOSPHATE PEST

	(PPM)		(PPM)
THIMET.............	LESS THAN 0.02	DIAZINON...........	LESS THAN 0.02
DISULFOTON.........	LESS THAN 0.02	METHYL PARATHION...	LESS THAN 0.02
MALATHION..........	0.21	PARATHION..........	LESS THAN 0.02
THIODAN............	LESS THAN 0.02	ETHION.............	LESS THAN 0.02
TRITHION...........	LESS THAN 0.02		

PESTICIDE & PCB

	(PPM)		(PPM)
ALDRIN.............	LESS THAN 0.02	DIELDRIN...........	LESS THAN 0.02
ENDRIN.............	LESS THAN 0.02	HEPTACHLOR.........	LESS THAN 0.02
HEPTACHLOR EPOXIDE.	LESS THAN 0.02	LINDANE............	LESS THAN 0.02
DDT................	LESS THAN 0.02	DDE................	LESS THAN 0.02
CHLORDANE..........	LESS THAN 0.02	PCB................	LESS THAN 0.15

RT LAB NUMBER 218062

CERTIFIED RODENT CHOW MEAL
LOT NUMBER MAY 05 83 2M

AFLATOXIN

TOTAL:LESS THAN 10 PPB

FOR ADDITIONAL INFORMATION, PLEASE CONTACT:
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(3) ALL OTHER QUESTIONS-RICHMOND, IN., MANUFACTURING PLANT 317-962-9561

SIGNED James R. Lange DATE 05/18/83
BY AND FOR ANALYTICAL SERVICES

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TO RICHMOND, IN

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D.C.SHELTON, 3RS
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LAB NO 218066 ENTERED 05/10/83 REPORTED 05/18/83 RHI 5002

CERTIFIED RODENT CHOW MEAL
LOT NUMBER MAY 05 83 2N

ASSAY	ANALYSIS	UNITS	LOW-LIMIT	HIGH-LIMIT
PROTEIN (N X 6.25)	20.5	%	20.0	
FAT (ACID HYDRO.)	6.36	%	4.50	
FIBER (CRUDE)	4.70	%		5.50
ARSENIC	LESS THAN 0.2 PPM			
CADMIUM	0.207	PPM		0.500
CALCIUM	0.828	%		
LEAD	0.444	PPM		1.50
MERCURY	LESS THAN .05 PPM			
PHOSPHORUS	0.702	%		
SELENIUM	0.238	PPM		

ORGANOPHOSPHATE PEST

	(PPM)		(PPM)
THIMET	LESS THAN 0.02	DIAZINON	LESS THAN 0.02
DISULFOTON	LESS THAN 0.02	METHYL PARATHION	LESS THAN 0.02
MALATHION	0.21	PARATHION	LESS THAN 0.02
THIODAN	LESS THAN 0.02	ETHION	LESS THAN 0.02
TRITHION	LESS THAN 0.02		

PESTICIDE & PCB

	(PPM)		(PPM)
ALDRIN	LESS THAN 0.02	DIELDRIN	LESS THAN 0.02
ENDRIN	LESS THAN 0.02	HEPTACHLOR	LESS THAN 0.02
HEPTACHLOR EPOXIDE	LESS THAN 0.02	LINDANE	LESS THAN 0.02
DDT	LESS THAN 0.02	DDE	LESS THAN 0.02
CHLORDANE	LESS THAN 0.02	PCB	LESS THAN 0.15

The term "Less Than" or the use of the symbol "<" is used to signify the lower limit of quantitation of the procedure under the conditions employed. The use of the term "Less Than" or "<" does not imply that traces of analyte were present. Samples submitted to Analytical Services for [illegible] analysis will be retained for a minimum of

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St. Louis, Missouri 63188

CERTIFIED RODENT CHOW MEAL
LOT NUMBER MAY 05 83 2N

AFLATOXIN

TOTAL:LESS THAN 10 PPB

FOR ADDITIONAL INFORMATION, PLEASE CONTACT:
(1) FOR ASSAY METHODOLOGY - JIM LANGE 314-982-3598
(2) FOR NUTRITIONAL INTERPRETATION-DR.D.C.SHELTON 314-982-3513
(3) ALL OTHER QUESTIONS-RICHMOND, IN., MANUFACTURING PLANT 317-962-9561

SIGNED James R. Lange DATE 05/18/83
BY AND FOR ANALYTICAL SERVICES

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St. Louis, Missouri 63164

TO RICHMOND, IN

CC RICHMOND, IND.
D.C.SHELTON, 3RS
J.R.SNYDER, 2RS

LAB NO 231329 ENTERED 07/19/83 REPORTED 07/25/83 RHI 5002

CERTIFIED RODENT CHOW MEAL
LOT NUMBER JUL 14 83 1E

ASSAY	ANALYSIS	UNITS	LOW-LIMIT	HIGH-LIMIT
PROTEIN (N X 6.25)	20.8	%	20.0	
FAT (ACID HYDRO.)	5.88	%	4.50	
FIBER (CRUDE)	5.49	%		5.50
ARSENIC	0.324	PPM		1.00
CADMIUM	0.104	PPM		0.500
CALCIUM	0.818	%		
LEAD	0.141	PPM		1.50
MERCURY	LESS THAN 0.05 PPM			
PHOSPHORUS	0.705	%		
SELENIUM	0.148	PPM		

ORGANOPHOSPHATE PEST

	(PPM)		(PPM)
THIMET.............	LESS THAN 0.02	DIAZINON...........	LESS THAN 0.02
DISULFOTON.........	LESS THAN 0.02	METHYL PARATHION...	LESS THAN 0.02
MALATHION..........	0.19	PARATHION..........	LESS THAN 0.02
THIODAN............	LESS THAN 0.02	ETHION.............	LESS THAN 0.02
TRITHION...........	LESS THAN 0.02		

PESTICIDE & PCB

	(PPM)		(PPM)
ALDRIN.............	LESS THAN 0.02	DIELDRIN...........	LESS THAN 0.02
ENDRIN.............	LESS THAN 0.02	HEPTACHLOR.........	LESS THAN 0.02
HEPTACHLOR EPOXIDE.	LESS THAN 0.02	LINDANE............	LESS THAN 0.02
DDT................	LESS THAN 0.02	DDE................	LESS THAN 0.02
CHLORDANE..........	LESS THAN 0.02	PCB................	LESS THAN 0.15

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RT LAB NUMBER 231329 PAGE 2

CERTIFIED RODENT CHOW MEAL
LOT NUMBER JUL 14 83 1E

AFLATOXIN
TOTAL:LESS THAN 10 PPB

FOR ADDITIONAL INFORMATION, PLEASE CONTACT:
(1) FOR ASSAY METHODOLOGY - JIM LANGE 314-982-3598
(2) FOR NUTRITIONAL INTERPRETATION-DR.D.C.SHELTON 314-982-3513
(3) ALL OTHER QUESTIONS-RICHMOND, IN., MANUFACTURING PLANT 317-962-9561

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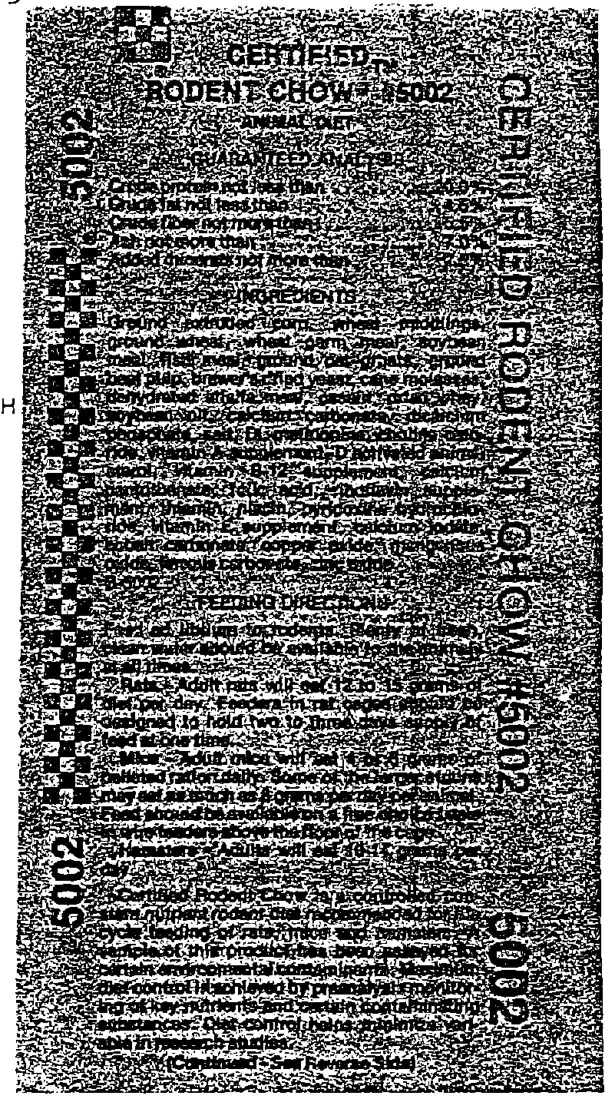
Recieved Oct. 10, 1983



CERTIFIED™ RODENT CHOW® #5002

GUARANTEED ANALYSIS

INGREDIENTS

FEEDING DIRECTIONS

(Continued - See Reverse Side)

TO RICHMOND, IN

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J.R.SNYDER, 1AP

LAB NO 249108 ENTERED 10/12/83 REPORTED 10/31/83 RH

CERTIFIED RODENT CHOW MEAL
LOT NUMBER OCT 13 83 2D

ASSAY	ANALYSIS	UNITS
PROTEIN (N X 6.25)	20.6	%
FAT (ACID HYDRO.)	5.47	%
FIBER (CRUDE)	5.44	%
ARSENIC	0.315	PPM
CADMIUM	0.275	PPM
CALCIUM	0.932	%
LEAD	0.236	PPM
MERCURY	LESS THAN 0.05 PPM	
PHOSPHORUS	0.774	%
SELENIUM	0.315	PPM

ORGANOPHOSPHATE PEST

	(PPM)		(PPM)
THIMET.............	LESS THAN 0.02	DIAZINON...........	LESS THAN 0.02
DISULFOTON.........	LESS THAN 0.02	METHYL PARATHION...	LESS THAN 0.02
MALATHION..........	0.40	PARATHION..........	LESS THAN 0.02
THIODAN............	LESS THAN 0.02	ETHION.............	LESS THAN 0.02
TRITHION...........	LESS THAN 0.02		

PESTICIDE & PCB

	(PPM)		(PPM)
ALDRIN.............	LESS THAN 0.02	DIELDRIN...........	LESS THAN 0.02
ENDRIN.............	LESS THAN 0.02	HEPTACHLOR.........	LESS THAN 0.02
HEPTACHLOR EPOXIDE.	LESS THAN 0.02	LINDANE............	LESS THAN 0.02
DDT................	LESS THAN 0.02	DDE................	LESS THAN 0.02
CHLORDANE..........	LESS THAN 0.02	PCB................	LESS THAN 0.15

RT LAB NUMBER 249103

CERTIFIED RODENT CHOW MEAL
LOT NUMBER OCT 13 83 2D

AFLATOXIN
TOTAL:LESS THAN 10 PPB

FOR ADDITIONAL INFORMATION, PLEASE CONTACT:
(1) FOR ASSAY METHODOLOGY - JIM LANGE 314-982-3598
(2) FOR NUTRITIONAL INTERPRETATION-DR.D.C.SHELTON 314-982-3513
(3) ALL OTHER QUESTIONS-RICHMOND, IN., MANUFACTURING PLANT 317-962-9561

SIGNED ---------------------------- DATE 10/31/83
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Central Research Services
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TO RICHMOND, IND.

CC D.C.SHELTON, 2AP
J.R.SNYDER, 1AP
RICHMOND, IN

LAB NO 264066 ENTERED 01/04/84 REPORTED 01/17/84 RHI 5002

CERTIFIED RODENT CHOW MEAL
LOT NUMBER DEC 29 83 2A

ASSAY	ANALYSIS	UNITS	LOW-LIMIT	HIGH-LIMIT
PROTEIN (N X 6.25)	21.2	%	20.0	
FAT (ACID HYDRO.)	5.62	%	4.50	
FIBER (CRUDE)	4.64	%		5.50
ARSENIC	0.260	PPM		1.00
CADMIUM	0.179	PPM		0.500
CALCIUM	0.880	%		
LEAD	0.592	PPM		1.50
MERCURY	LESS THAN 0.05	PPM		
PHOSPHORUS	0.752	%		
SELENIUM	0.259	PPM		

ORGANOPHOSPHATE PEST

	(PPM)		(PPM)
DIAZINON...........	LESS THAN 0.02	PARATHION..........	LESS THAN 0.02
DISULFOTON.........	LESS THAN 0.02	THIMET.............	LESS THAN 0.02
ETHION.............	LESS THAN 0.02	THIODAN............	LESS THAN 0.02
MALATHION..........	0.34	TRITHION...........	LESS THAN 0.02
METHYL PARATHION...	LESS THAN 0.02		

PESTICIDE & PCB

	(PPM)		(PPM)
ALDRIN.............	LESS THAN 0.02	ENDRIN.............	LESS THAN 0.02
ALPHA-BHC..........	LESS THAN 0.02	HCB................	LESS THAN 0.02
BETA-BHC...........	LESS THAN 0.02	HEPTACHLOR.........	LESS THAN 0.02
DELTA-BHC..........	LESS THAN 0.02	HEPTACHLOR EPOXIDE.	LESS THAN 0.02
CHLORDANE..........	LESS THAN 0.02	LINDANE............	LESS THAN 0.02
DDE................	LESS THAN 0.02	METHOXYCHLOR.......	LESS THAN 0.02

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. Samples submitted to Central Research Services for routine analysis will be retained for a minimum of thirty (30) days after the report of analysis is issued. Extended storage requirements must be brought to the attention of Central Research Services prior to or at the time of sample submission.

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RT LAB NUMBER 264066 PAGE 2

CERTIFIED RODENT CHOW MEAL
LOT NUMBER DEC 29 83 2A

PESTICIDE & PCB (CONTINUED)

DDT(TOTAL).........	LESS THAN 0.02	MIREX..............	LESS THAN 0.02
DIELDRIN...........	LESS THAN 0.02	PCB.................	LESS THAN 0.15

AFLATOXIN

TOTAL:LESS THAN 10 PPB

FOR ADDITIONAL INFORMATION, PLEASE CONTACT:
(1) FOR ASSAY METHODOLOGY - JIM LANGE 314-982-3558
(2) FOR NUTRITIONAL INTERPRETATION-DR.D.C.SHELTON 314-982-3513
(3) ALL OTHER QUESTIONS-RICHMOND, IN., MANUFACTURING PLANT 317-962-9561

SIGNED James R. Lange DATE 01/17/84
BY AND FOR ANALYTICAL SERVICES

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. Samples submitted to Central Research Services for routine analysis will be retained for a minimum of thirty (30) days after the report of analysis is issued. Extended storage requirements must be brought to the attention of Central Research Services prior to or at the time of sample submission.

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TO RICHMOND, IN

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J.R.SNYDER, 1AP

LAB NO 267990 ENTERED 01/23/84 REPORTED 02/06/84 RHI 5002

CERTIFIED RODENT CHOW MEAL
LOT NUMBER JAN 20 84 2B

ASSAY	ANALYSIS	UNITS	LOW-LIMIT	HIGH-LIMIT
PROTEIN (N X 6.25)	20.4	%	20.0	
FAT (ACID HYDRO.)	5.72	%	4.50	
FIBER (CRUDE)	4.97	%		5.50
ARSENIC	0.414	PPM		1.00
CADMIUM	0.201	PPM		0.500
LEAD	0.246	PPM		1.50
MERCURY	LESS THAN 0.05 PPM			
PHOSPHORUS	0.772	%		
SELENIUM	0.343	PPM		

ORGANOPHOSPHATE PEST

	(PPM)		(PPM)
DIAZINON	LESS THAN 0.02	PARATHION	LESS THAN 0.02
DISULFOTON	LESS THAN 0.02	THIMET	LESS THAN 0.02
ETHION	LESS THAN 0.02	THIODAN	LESS THAN 0.02
MALATHION	0.25	TRITHION	LESS THAN 0.02
METHYL PARATHION	LESS THAN 0.02		

PESTICIDE & PCB

	(PPM)		(PPM)
ALDRIN	LESS THAN 0.02	ENDRIN	LESS THAN 0.02
ALPHA-BHC	LESS THAN 0.02	HCB	LESS THAN 0.02
BETA-BHC	LESS THAN 0.02	HEPTACHLOR	LESS THAN 0.02
DELTA-BHC	LESS THAN 0.02	HEPTACHLOR EPOXIDE	LESS THAN 0.02
CHLORDANE	LESS THAN 0.02	LINDANE	LESS THAN 0.02
DDE	LESS THAN 0.02	METHOXYCHLOR	LESS THAN 0.02
DDT(TOTAL)	LESS THAN 0.02	MIREX	LESS THAN 0.02
DIELDRIN	LESS THAN 0.02	PCB	LESS THAN 0.15

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RT LAB NUMBER 287990 PAGE 2

CERTIFIED RODENT CHOW MEAL
LOT NUMBER JAN 20 84 2B

AFLATOXIN
TOTAL:LESS THAN 10 PPB

FOR ADDITIONAL INFORMATION, PLEASE CONTACT:
(1) FOR ASSAY METHODOLOGY - JIM LANGE 314-982-3598
(2) FOR NUTRITIONAL INTERPRETATION-DR.D.C.SHELTON 314-982-3513
(3) ALL OTHER QUESTIONS-RICHMOND, IN., MANUFACTURING PLANT 317-962-9561

SIGNED James R. Lange DATE 02/07/84
BY AND FOR ANALYTICAL SERVICES

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TO RICHMOND, IND. C

CC RICHMOND, IND. C
RICHMOND, IND. C
RICHMOND, IND.
J.R. SNYDER 1AP
D.C. SHELTON 2AP

LAB NO 269695 ENTERED 01/31/84 REPORTED 02/04/84 RHI 0

CERTIFIED RODENT CHOW MEAL
LOT NUMBER JAN 20 84 2B

ASSAY	ANALYSIS	UNITS	LOW-LIMIT	HIGH-LIMIT
CALCIUM	0.877	%		

FOR ADDITIONAL INFORMATION, PLEASE CONTACT:
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RICHMOND, IN

LAB NO 291061 ENTERED 05/07/84 REPORTED 05/17/84 RHI 5002

CERTIFIED RODENT CHOW MEAL
LOT NUMBER MAY 03 84 1A

ASSAY	ANALYSIS	UNITS	LOW-LIMIT	HIGH-LIMIT
PROTEIN (N X 6.25)	20.8	%	20.0	
FAT (ACID HYDRO.)	5.69	%	4.50	
FIBER (CRUDE)	4.57	%		5.50
ARSENIC	LESS THAN 0.2 PPM			
CADMIUM	0.153	PPM		0.500
CALCIUM	0.809	%		
LEAD	0.240	PPM		1.50
MERCURY	LESS THAN 0.05 PPM			
PHOSPHORUS	0.687	%		
SELENIUM	0.376	PPM		

ORGANOPHOSPHATE PEST

	(PPM)		(PPM)
DIAZINON...........	LESS THAN 0.02	PARATHION..........	LESS THAN 0.02
DISULFOTON.........	LESS THAN 0.02	THIMET.............	LESS THAN 0.02
ETHION.............	LESS THAN 0.02	THIODAN............	LESS THAN 0.02
MALATHION..........	0.38	TRITHION...........	LESS THAN 0.02
METHYL PARATHION...	LESS THAN 0.02		

PESTICIDE & PCB

	(PPM)		(PPM)
ALDRIN.............	LESS THAN 0.02	ENDRIN.............	LESS THAN 0.02
ALPHA-BHC..........	LESS THAN 0.02	HCB................	LESS THAN 0.02
BETA-BHC...........	LESS THAN 0.02	HEPTACHLOR.........	LESS THAN 0.02
DELTA-BHC..........	LESS THAN 0.02	HEPTACHLOR EPOXIDE.	LESS THAN 0.02
CHLORDANE..........	LESS THAN 0.02	LINDANE............	LESS THAN 0.02

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CERTIFIED RODENT CHOW MEAL
LOT NUMBER MAY 03 84 1A

PESTICIDE & PCB (CONTINUED)

DDE................	LESS THAN 0.02	METHOXYCHLOR.......	0.17
DDT..(TOTAL).......	LESS THAN 0.02	MIREX..............	LESS THAN 0.02
DIELDRIN...........	LESS THAN 0.02	PCB................	LESS THAN 0.15

AFLATOXIN

TOTAL:LESS THAN 10 PPB

FOR ADDITIONAL INFORMATION, PLEASE CONTACT:
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(2) FOR NUTRITIONAL INTERPRETATION-DR.D.C.SHELTON 314-982-3513
(3) ALL OTHER QUESTIONS-RICHMOND, IN., MANUFACTURING PLANT 317-962-9561

SIGNED ------------------------------ DATE 05/17/84
/BY AND FOR ANALYTICAL SERVICES

APPENDIX 7

MEAN BODY WEIGHTS

TABLE 7-1

MIDWEST RESEARCH INSTITUTE
EFFECTS OF INHALED 1,2-DICHLOROETHANE IN RATS TREATED WITH DISULFIRAM OR ETHANOL
BODY WEIGHTS (g) MALE RATS

WEEK	CONTROL	DS	% WD[a]	ET	% WD	EDC	% WD	EDC/DS	% WD	EDC/ET	% WD
-1	85.9 +/- 7.6(50)[b]	85.9 +/- 7.6(50)		85.9 +/- 7.8(50)		85.8 +/- 7.7(50)		85.9 +/- 7.7(50)		85.9 +/- 7.8(50)	
1	157.5 +/- 13.6(50)	128.5 +/- 14.6(50)	-40.5[c]	154.9 +/- 15.3(50)	-3.6	159.4 +/- 12.4(50)	2.8	138.2 +/- 12.9(50)	-27.0[c]	158.9 +/- 19.0(50)	2.0
2	179.2 +/- 14.4(50)	154.1 +/- 25.3(50)	-26.9	161.3 +/- 21.6(50)	-19.2	185.3 +/- 13.4(50)	6.6	160.0 +/- 13.0(50)	-20.6	107.2 +/- 13.4(50)	8.6
3	229.7 +/- 18.3(50)	200.9 +/- 23.5(50)	-20.0	220.0 +/- 18.6(50)	-6.7	238.2 +/- 22.5(50)	6.0	195.4 +/- 16.0(50)	-23.9	235.3 +/- 16.7(50)	3.9
4	269.8 +/- 21.5(50)	235.9 +/- 26.5(50)	-18.4	262.1 +/- 21.9(50)	-4.2	278.4 +/- 20.6(50)	4.7	228.3 +/- 21.3(50)	-22.6	276.9 +/- 20.4(50)	3.9
5	301.3 +/- 31.3(50)	263.3 +/- 27.9(50)	-17.6	294.8 +/- 23.8(50)	-3.0	312.5 +/- 21.9(50)	5.2	253.7 +/- 24.6(50)	-22.1	304.3 +/- 21.6(49)	1.4
6	334.9 +/- 29.3(49)	284.4 +/- 30.0(50)	-20.3	328.5 +/- 26.1(50)	-2.6	338.3 +/- 24.7(50)	1.4	273.3 +/- 27.8(50)	-24.7	330.2 +/- 26.0(49)	-1.9
7	361.2 +/- 32.6(49)	301.2 +/- 31.7(50)	-21.8	351.8 +/- 29.0(50)	-3.4	359.0 +/- 27.9(50)	-.8	284.4 +/- 29.4(50)	-27.9	353.7 +/- 28.1(49)	-2.7
8	372.3 +/- 41.0(49)	330.4 +/- 76.1(50)	-14.6	376.5 +/- 31.5(50)	1.5	386.6 +/- 30.5(50)	5.0	310.6 +/- 31.3(50)	-21.5	382.5 +/- 29.6(49)	3.6
12	444.6 +/- 40.3(49)	371.0 +/- 38.3(50)	-20.5	449.9 +/- 37.4(50)	1.5	456.1 +/- 35.9(50)	3.2	363.8 +/- 34.2(50)	-22.5	442.9 +/- 37.6(49)	-.5
16	477.5 +/- 45.0(49)	417.8 +/- 38.9(50)	-15.2	488.0 +/- 40.8(50)	2.7	495.3 +/- 43.2(50)	4.6	399.2 +/- 34.0(50)	-20.0	481.0 +/- 43.6(49)	0.9
20	513.8 +/- 48.9(49)	446.8 +/- 41.2(50)	-15.7	514.8 +/- 45.6(50)	0.2	524.2 +/- 44.8(50)	2.5	427.1 +/- 37.8(50)	-20.3	509.0 +/- 47.5(49)	-1.1
24	527.9 +/- 53.9(49)	459.2 +/- 41.9(50)	-15.5	537.9 +/- 48.6(50)	2.3	534.4 +/- 47.4(50)	1.5	435.4 +/- 41.2(50)	-20.9	527.2 +/- 51.1(49)	-.2
28	537.0 +/- 53.3(49)	477.5 +/- 47.6(50)	-13.2	557.2 +/- 50.5(50)	4.5	551.7 +/- 45.1(49)	3.3	457.9 +/- 41.5(50)	-17.5	542.9 +/- 54.2(49)	1.3
32	559.4 +/- 55.3(49)	496.7 +/- 53.0(50)	-13.2	578.9 +/- 56.2(50)	4.1	565.7 +/- 46.4(49)	1.4	476.6 +/- 42.8(50)	-17.5	566.1 +/- 53.1(49)	1.4
36	567.6 +/- 63.0(49)	507.7 +/- 56.9(50)	-12.4	593.6 +/- 58.4(49)	5.4	580.7 +/- 48.4(49)	2.7	488.7 +/- 43.3(50)	-16.4	574.8 +/- 57.0(49)	1.5
40	593.0 +/- 64.0(49)	520.1 +/- 59.4(50)	-14.4	613.8 +/- 59.7(48)	4.1	600.9 +/- 53.2(49)	1.6	500.4 +/- 48.0(49)	-18.3	591.6 +/- 64.0(49)	-.3
44	602.8 +/- 69.5(48)	516.9 +/- 61.5(50)	-16.6	623.7 +/- 63.0(48)	4.0	610.0 +/- 57.8(49)	1.4	497.7 +/- 47.5(49)	-20.3	608.2 +/- 60.4(49)	1.0
48	618.7 +/- 71.7(48)	536.7 +/- 63.7(50)	-15.4	639.5 +/- 65.7(48)	3.9	622.1 +/- 58.5(49)	0.7	511.1 +/- 48.7(48)	-20.2	621.9 +/- 60.4(48)	0.6
52	628.3 +/- 74.2(48)	547.1 +/- 67.0(50)	-15.0	651.6 +/- 68.7(48)	4.3	635.4 +/- 63.9(48)	1.3	529.2 +/- 49.6(48)	-18.3	639.6 +/- 62.1(47)	2.1
56	637.6 +/- 75.7(48)	560.2 +/- 79.7(50)	-14.0	657.5 +/- 69.8(48)	3.6	643.6 +/- 69.4(48)	1.1	539.1 +/- 51.7(47)	-17.9	642.3 +/- 62.6(46)	0.9
61	642.4 +/- 74.2(48)	565.7 +/- 74.3(49)	-13.8	666.3 +/- 74.2(48)	4.3	649.5 +/- 71.0(48)	1.3	540.8 +/- 52.2(46)	-18.3	655.3 +/- 67.1(45)	2.3
64	640.3 +/- 75.5(48)	575.2 +/- 76.6(49)	-11.7	671.0 +/- 77.9(48)	5.5	652.9 +/- 72.6(48)	2.3	545.5 +/- 53.5(46)	-17.1	658.8 +/- 70.1(45)	3.3
68	637.2 +/- 87.9(48)	579.2 +/- 78.8(49)	-10.5	677.4 +/- 88.3(47)	7.3	655.1 +/- 83.1(48)	3.3	555.1 +/- 63.2(45)	-14.9	672.3 +/- 66.6(44)	6.4
72	650.8 +/- 78.6(46)	581.7 +/- 82.3(48)	-12.2	683.3 +/- 103.1(45)	5.8	668.1 +/- 87.8(45)	3.1	558.1 +/- 57.8(45)	-16.4	603.6 +/- 72.1(44)	5.8
76	659.1 +/- 81.7(46)	592.0 +/- 76.5(47)	-11.7	694.2 +/- 110.3(40)	6.1	677.6 +/- 95.4(43)	3.2	555.0 +/- 60.0(45)	-18.2	688.8 +/- 82.6(44)	5.2
80	667.1 +/- 83.7(45)	592.4 +/- 80.0(46)	-12.9	699.6 +/- 108.9(39)	5.6	687.4 +/- 96.6(42)	3.5	564.1 +/- 62.1(43)	-17.7	694.2 +/- 86.5(44)	4.7
84	657.4 +/- 86.9(45)	594.4 +/- 88.5(44)	-12.8	696.7 +/- 117.1(39)	6.9	676.5 +/- 104.0(41)	3.4	558.0 +/- 52.1(42)	-17.4	676.2 +/- 91.0(41)	3.3
88	652.0 +/- 89.5(38)	591.8 +/- 97.7(42)	-10.6	695.5 +/- 115.7(38)	7.7	677.4 +/- 120.3(40)	4.5	553.4 +/- 64.1(38)	-17.4	675.3 +/- 92.9(39)	4.1
92	650.2 +/- 87.3(35)	593.2 +/- 96.6(41)	-10.1	695.8 +/- 112.5(34)	8.1	695.8 +/- 105.3(36)	8.1	551.9 +/- 59.8(32)	-17.4	680.2 +/- 90.0(33)	5.3
96	645.8 +/- 106.1(32)	611.3 +/- 90.5(36)	-6.2	685.5 +/- 102.3(34)	7.1	701.7 +/- 120.1(36)	10.0	540.4 +/- 64.7(28)	-18.8	686.4 +/- 97.4(30)	7.3
100	643.9 +/- 113.4(31)	613.8 +/- 96.7(36)	-5.4	665.7 +/- 115.1(30)	3.9	686.8 +/- 143.7(33)	7.7	539.8 +/- 75.5(24)	-18.7	702.2 +/- 84.5(27)	10.4
105 (T)	607.9 +/- 114.0(26)	605.8 +/- 95.4(35)	-.4	624.0 +/- 107.5(26)	-3.1	672.2 +/- 121.5(26)	12.3	526.3 +/- 61.8(22)	-15.6	657.1 +/- 105.0(26)	9.4
MEAN			-14.1		2.1		3.5		-18.5		2.8

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[a] Weight change of the dosed group relative to that of the control =

$$\frac{\text{Weight Change (Dosed Group) - Weight Change (Control Group)}}{\text{Weight Change (Control Group)}} \times 100$$

[b] Mean ± S.D. (n).

[c] All DS and EDC/DS body weight means for weeks 1 through 100 were significantly different from control (Dunnett's Multiple Comparison, $p \leq 0.05$).

(T) - Terminal body weights recorded at necropsy.

TABLE 7-2

MIDWEST RESEARCH INSTITUTE
EFFECTS OF INHALED 1,2-DICHLOROETHANE IN RATS TREATED WITH DISULFIRAM OR ETHANOL
BODY WEIGHTS (g) FEMALE RATS

WEEK	CONTROL	DS	% WD[a]	ET	% WD	EDC	% WD	EDC/DS	% WD	EDC/ET	% WD
-1	84.9 +/- 9.0(50)[b]	84.7 +/- 8.2(50)		84.6 +/- 7.9(50)		84.6 +/- 7.8(50)		84.9 +/- 8.7(50)		84.6 +/- 7.9(50)	
1	133.6 +/- 10.1(50)	115.2 +/- 9.3(50)	-37.4[c]	129.6 +/- 9.6(50)	-7.6	136.2 +/- 10.5(50)	6.0	120.6 +/- 10.1(50)	-26.7[c]	133.7 +/- 9.0(50)	0.8
2	143.3 +/- 10.2(50)	125.7 +/- 9.4(50)	-29.8	140.0 +/- 10.7(50)	-5.1	147.9 +/- 11.8(50)	8.4	132.5 +/- 10.3(50)	-18.5	146.0 +/- 10.2(50)	5.1
3	162.5 +/- 12.4(50)	144.8 +/- 10.3(50)	-22.6	161.3 +/- 13.7(50)	-1.2	169.8 +/- 15.9(50)	9.8	148.8 +/- 11.2(50)	-17.7	165.6 +/- 12.7(50)	4.4
4	182.0 +/- 12.7(50)	154.7 +/- 10.4(50)	-27.9	179.9 +/- 14.7(50)	-1.9	186.3 +/- 16.2(50)	4.7	160.1 +/- 11.9(50)	-22.6	184.7 +/- 15.0(50)	3.1
5	194.7 +/- 13.8(50)	165.9 +/- 11.9(50)	-26.0	188.8 +/- 15.7(50)	-5.1	201.6 +/- 17.1(50)	6.6	169.8 +/- 13.5(50)	-22.7	195.6 +/- 15.5(49)	1.1
6	207.1 +/- 17.1(50)	173.4 +/- 12.8(50)	-27.4	203.5 +/- 17.5(50)	-2.7	213.3 +/- 20.0(50)	5.3	176.9 +/- 14.3(50)	-24.7	207.8 +/- 17.1(49)	0.8
7	217.6 +/- 17.6(50)	178.7 +/- 13.1(50)	-29.2	213.5 +/- 20.4(50)	-2.9	221.8 +/- 22.3(50)	3.4	183.8 +/- 15.6(50)	-25.5	217.6 +/- 19.6(49)	0.2
8	228.1 +/- 19.0(50)	187.9 +/- 13.9(50)	-27.9	224.2 +/- 22.2(50)	-2.5	232.1 +/- 24.0(50)	3.0	191.6 +/- 15.7(50)	-25.5	228.9 +/- 20.1(49)	0.8
12	258.9 +/- 22.1(50)	211.3 +/- 14.7(50)	-27.2	255.1 +/- 24.8(50)	-2.0	261.7 +/- 29.2(50)	1.8	212.5 +/- 17.2(50)	-26.7	256.5 +/- 25.8(49)	-1.2
16	273.9 +/- 23.5(50)	223.9 +/- 15.7(50)	-26.3	271.6 +/- 27.1(50)	-1.1	278.0 +/- 31.5(50)	2.3	227.7 +/- 19.5(50)	-24.4	272.5 +/- 28.0(49)	-.6
20	285.8 +/- 26.2(50)	234.1 +/- 17.1(50)	-25.6	285.8 +/- 31.9(50)	0.1	288.7 +/- 33.3(50)	1.6	235.1 +/- 19.1(50)	-25.2	286.7 +/- 31.3(49)	0.6
24	294.3 +/- 29.1(50)	238.9 +/- 17.7(50)	-26.4	291.6 +/- 39.8(50)	-1.1	298.3 +/- 36.6(50)	2.1	239.8 +/- 19.6(50)	-26.0	294.9 +/- 33.1(49)	0.4
28	304.9 +/- 30.4(50)	247.9 +/- 19.2(50)	-25.8	308.5 +/- 40.7(50)	1.8	308.5 +/- 38.6(50)	1.8	248.0 +/- 23.4(50)	-25.9	308.9 +/- 37.3(49)	2.0
32	319.0 +/- 34.5(50)	256.8 +/- 23.6(50)	-26.5	320.6 +/- 45.4(50)	0.8	322.3 +/- 42.8(50)	1.5	256.2 +/- 23.5(50)	-26.8	320.9 +/- 40.4(49)	0.9
36	328.9 +/- 36.5(50)	259.5 +/- 25.9(50)	-28.4	324.7 +/- 55.3(50)	-1.6	330.1 +/- 44.6(50)	0.6	262.6 +/- 24.9(50)	-27.2	329.7 +/- 42.8(49)	0.5
40	338.1 +/- 40.0(50)	259.0 +/- 28.5(50)	-31.2	344.4 +/- 56.0(50)	2.6	341.3 +/- 49.8(50)	1.4	265.2 +/- 26.8(50)	-28.8	344.1 +/- 47.9(49)	2.5
44	342.7 +/- 41.2(50)	264.6 +/- 30.0(50)	-30.2	348.8 +/- 59.9(50)	2.5	349.1 +/- 51.9(50)	2.6	266.7 +/- 29.2(50)	-29.5	355.1 +/- 51.1(49)	4.9
48	358.6 +/- 48.0(50)	272.9 +/- 33.2(50)	-31.2	363.8 +/- 65.3(50)	2.0	359.5 +/- 55.2(49)	0.4	274.9 +/- 32.7(50)	-30.6	370.6 +/- 59.4(49)	4.5
52	370.2 +/- 50.6(50)	279.1 +/- 37.3(50)	-31.9	377.2 +/- 70.7(49)	2.6	374.5 +/- 58.7(49)	1.6	282.0 +/- 37.0(49)	-30.9	389.3 +/- 62.9(48)	6.8
56	380.8 +/- 53.5(50)	289.1 +/- 40.5(50)	-30.9	386.3 +/- 75.6(47)	2.0	381.5 +/- 60.7(49)	0.3	290.3 +/- 38.6(49)	-30.6	400.7 +/- 66.1(48)	6.8
61	389.9 +/- 54.2(50)	297.2 +/- 43.1(50)	-30.3	401.6 +/- 82.6(47)	3.9	389.5 +/- 64.9(49)	0.0	293.8 +/- 38.6(49)	-31.5	408.1 +/- 74.7(48)	6.1
64	388.1 +/- 56.1(48)	298.4 +/- 45.8(50)	-29.5	407.0 +/- 87.0(46)	6.3	393.8 +/- 66.2(49)	2.0	294.1 +/- 40.6(47)	-31.0	419.9 +/- 76.0(46)	10.6
68	399.1 +/- 58.3(46)	305.4 +/- 49.3(49)	-29.8	417.6 +/- 89.1(45)	6.0	402.6 +/- 69.7(49)	1.2	301.4 +/- 44.6(46)	-31.1	431.0 +/- 81.4(46)	10.2
72	411.9 +/- 61.1(45)	315.0 +/- 50.4(48)	-29.6	435.6 +/- 95.0(43)	7.3	412.9 +/- 75.3(48)	0.4	307.5 +/- 46.3(46)	-31.9	445.7 +/- 88.7(45)	10.4
76	422.8 +/- 66.3(44)	319.9 +/- 53.0(48)	-30.4	449.5 +/- 90.1(40)	8.0	419.7 +/- 72.5(44)	-.8	311.6 +/- 48.3(40)	-32.9	452.3 +/- 101.8(45)	8.8
80	436.1 +/- 65.7(42)	323.9 +/- 49.5(44)	-31.9	463.6 +/- 99.4(38)	7.9	431.4 +/- 80.7(43)	-1.3	319.8 +/- 47.8(39)	-33.1	471.6 +/- 101.9(43)	10.2
84	441.8 +/- 76.4(41)	326.2 +/- 51.1(42)	-32.3	466.0 +/- 106.5(37)	6.9	442.6 +/- 89.6(38)	0.3	318.5 +/- 48.3(37)	-34.5	473.8 +/- 112.6(41)	9.1
88	436.3 +/- 74.4(39)	324.3 +/- 52.3(40)	-31.8	472.8 +/- 108.7(36)	10.5	450.1 +/- 100.3(38)	4.0	321.1 +/- 53.7(34)	-32.8	472.3 +/- 120.6(38)	10.3
92	430.7 +/- 79.9(39)	333.9 +/- 52.6(37)	-27.9	481.5 +/- 113.6(31)	14.8	460.9 +/- 96.8(37)	8.8	331.2 +/- 62.5(33)	-28.8	486.3 +/- 125.6(31)	16.2
96	449.8 +/- 75.8(34)	339.0 +/- 55.6(35)	-30.3	493.1 +/- 118.0(29)	11.9	458.0 +/- 93.5(33)	2.3	341.9 +/- 67.3(29)	-29.6	501.9 +/- 131.5(28)	14.4
100	444.2 +/- 74.6(30)	339.5 +/- 60.3(35)	-29.1	498.3 +/- 109.9(28)	12.4	463.8 +/- 86.3(32)	5.5	342.6 +/- 58.4(25)	-28.3	509.4 +/- 140.0(26)	18.2
105(T)	417.6 +/- 93.6(27)	331.0 +/- 63.0(33)	-26.0	470.1 +/- 117.6(27)	15.9	441.6 +/- 87.7(32)	7.3	348.5 +/- 74.7(22)	-20.8	523.2 +/- 155.4(22)	31.8
MEAN			-27.3		2.7		2.8		-26.0		5.9

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[a] Weight change of the dosed group relative to that of the control =

$$\frac{\text{Weight Change (Dosed Group) - Weight Change (Control Group)}}{\text{Weight Change (Control Group)}} \times 100$$

[b] Mean ± S.D. (n).

[c] All DS and EDC/DS body weight means for weeks 1 through 100 were significantly different from control (Dunnett's Multiple Comparison, $p \leq 0.05$).

(T) - Terminal body weights recorded at necropsy.

APPENDIX 8

FOOD AND WATER CONSUMPTION DATA

TABLE 8-1

MIDWEST RESEARCH INSTITUTE
EFFECTS OF INHALED 1,2-DICHLOROETHANE IN RATS TREATED WITH DISULFIRAM OR ETHANOL
FEED CONSUMPTION (g) MALE RATS

WEEK	CONTROL	DS	% C[a]	ET	% C	EDC	% C	EDC/DS	% C	EDC/ET	% C
1	19.5 +/- 1.8(50)[b]	13.1 +/- 5.1(50)	-32.8	19.2 +/- 2.2(50)	-1.5	20.1 +/- 2.3(50)	3.1	13.8 +/- 3.7(50)	-29.2	20.0 +/- 1.8(50)	2.6
2	17.9 +/- 2.4(50)	16.3 +/- 3.7(50)	-8.9	15.5 +/- 1.7(50)	-13.4	18.6 +/- 2.1(50)	3.9	14.7 +/- 2.5(50)	-17.9	15.6 +/- 1.8(50)	-12.8
3	23.7 +/- 7.2(50)	19.7 +/- 4.0(50)	-16.9	18.9 +/- 2.2(50)	-20.3	22.3 +/- 6.1(50)	-5.9	16.9 +/- 3.9(50)	-28.7	17.7 +/- 2.2(50)	-25.3
4	20.5 +/- 3.9(50)	20.0 +/- 4.6(50)	-2.4	18.3 +/- 2.1(50)	-10.7	22.4 +/- 3.0(50)	9.3	15.9 +/- 4.2(50)	-22.4	18.3 +/- 3.0(50)	-10.7
5	21.8 +/- 3.8(50)	20.2 +/- 3.7(50)	-7.3	20.3 +/- 3.4(50)	-6.9	23.3 +/- 4.1(50)	6.9	17.9 +/- 2.6(50)	-17.9	18.3 +/- 2.9(49)	-16.1
6	20.1 +/- 7.6(49)	18.2 +/- 5.4(50)	-9.5	16.5 +/- 5.1(50)	-17.9	20.0 +/- 5.0(50)	-.5	17.0 +/- 4.8(50)	-15.4	17.5 +/- 3.2(49)	-12.9
7	22.9 +/- 2.6(49)	19.1 +/- 3.0(50)	-16.6	18.8 +/- 2.1(50)	-17.9	25.5 +/- 9.4(50)	11.4	18.7 +/- 3.4(50)	-18.3	20.2 +/- 4.4(49)	-11.8
8	21.8 +/- 4.2(49)	17.9 +/- 3.4(50)	-17.9	16.4 +/- 3.9(50)	-24.8	19.0 +/- 7.3(50)	-12.8	16.0 +/- 3.5(50)	-26.6	14.4 +/- 5.2(49)	-33.9
9	23.2 +/- 2.9(49)	18.2 +/- 3.6(50)	-21.6	19.0 +/- 3.2(50)	-18.1	20.6 +/- 5.0(50)	-11.2	17.1 +/- 4.3(50)	-26.3	14.7 +/- 4.5(49)	-36.6
10	19.1 +/- 4.9(49)	18.5 +/- 3.4(50)	-3.1	18.8 +/- 2.3(50)	-1.6	21.8 +/- 3.8(50)	14.1	18.2 +/- 4.6(50)	-4.7	18.1 +/- 2.8(49)	-5.2
11	21.3 +/- 3.8(49)	19.4 +/- 2.6(50)	-8.9	18.6 +/- 3.2(50)	-12.7	24.7 +/- 8.3(50)	16.0	18.7 +/- 4.4(50)	-12.2	20.8 +/- 5.1(49)	-2.3
12	20.7 +/- 4.9(49)	20.4 +/- 2.7(50)	-1.4	20.9 +/- 3.6(50)	1.0	22.7 +/- 3.9(50)	9.7	19.0 +/- 2.9(50)	-8.2	18.1 +/- 3.9(49)	-12.6
14	23.2 +/- 7.9(49)	21.7 +/- 6.7(50)	-6.5	17.1 +/- 4.4(50)	-26.3	22.8 +/- 15.9(50)	-1.7	21.3 +/- 11.6(50)	-8.2	8.3 +/- 6.7(49)	-64.2
16	25.4 +/- 6.5(49)	20.6 +/- 3.2(50)	-18.9	18.2 +/- 3.8(50)	-28.3	25.9 +/- 10.9(50)	2.0	19.1 +/- 2.7(50)	-24.8	23.5 +/- 10.9(49)	-7.5
18	23.5 +/- 5.5(49)	19.9 +/- 4.5(50)	-15.3	17.8 +/- 2.3(50)	-24.3	21.7 +/- 6.0(50)	-7.7	18.7 +/- 5.7(50)	-20.4	21.3 +/- 11.7(49)	-9.4
20	28.3 +/- 15.8(49)	20.7 +/- 3.2(50)	-26.9	19.6 +/- 5.0(50)	-30.7	22.6 +/- 4.4(50)	-20.1	19.9 +/- 4.3(50)	-29.7	18.9 +/- 3.3(49)	-33.2
22	26.9 +/- 12.8(49)	19.5 +/- 3.5(50)	-27.5	21.9 +/- 11.9(50)	-18.6	22.7 +/- 9.3(50)	-15.6	19.2 +/- 3.9(50)	-28.6	22.5 +/- 11.5(49)	-16.4
24	27.0 +/- 13.7(49)	20.5 +/- 3.5(50)	-24.1	19.3 +/- 2.6(50)	-28.5	22.2 +/- 7.0(50)	-17.8	21.1 +/- 7.2(50)	-21.9	20.9 +/- 7.7(49)	-22.6
28	24.9 +/- 13.6(49)	20.2 +/- 5.7(50)	-18.9	19.5 +/- 2.5(50)	-21.7	25.7 +/- 12.9(49)	3.2	19.4 +/- 6.7(50)	-22.1	20.4 +/- 11.2(49)	-18.1
32	43.1 +/- 18.5(49)	36.3 +/- 15.2(50)	-15.8	33.2 +/- 10.6(50)	-23.0	26.9 +/- 12.6(49)	-37.6	30.9 +/- 9.1(50)	-28.3	29.2 +/- 10.4(49)	-32.3
36	23.7 +/- 5.2(42)	20.5 +/- 3.6(43)	-13.5	20.9 +/- 3.2(47)	-11.8	22.3 +/- 3.4(43)	-5.9	20.3 +/- 3.6(50)	-14.3	19.6 +/- 3.8(42)	-17.3
40	22.5 +/- 3.6(43)	21.1 +/- 4.7(42)	-6.2	20.1 +/- 4.1(45)	-10.7	21.1 +/- 3.8(43)	-6.2	19.6 +/- 3.2(46)	-12.9	19.0 +/- 2.9(38)	-15.6
44	24.6 +/- 4.1(40)	23.1 +/- 3.5(42)	-6.1	22.4 +/- 6.9(44)	-8.9	21.8 +/- 4.8(42)	-11.4	21.1 +/- 3.2(45)	-14.2	20.5 +/- 5.4(43)	-16.7
48	22.6 +/- 3.2(39)	23.0 +/- 3.6(42)	1.8	18.4 +/- 5.1(44)	-18.6	21.0 +/- 3.7(40)	-7.1	20.7 +/- 3.7(46)	-8.4	17.9 +/- 3.9(40)	-20.8
52	24.8 +/- 5.6(41)	22.4 +/- 3.5(42)	-9.7	23.3 +/- 4.0(45)	-6.0	23.2 +/- 4.2(39)	-6.5	21.3 +/- 2.9(44)	-14.1	20.4 +/- 8.0(38)	-17.7
56	23.7 +/- 3.9(38)	23.4 +/- 3.4(42)	-1.3	21.0 +/- 4.6(42)	-11.4	23.5 +/- 6.7(41)	-.8	21.1 +/- 3.4(42)	-11.0	18.9 +/- 4.3(38)	-20.3
61	26.2 +/- 4.7(40)	23.7 +/- 3.4(42)	-9.5	25.2 +/- 6.7(42)	-3.8	26.2 +/- 10.1(43)	0.0	21.9 +/- 3.6(43)	-16.4	21.5 +/- 5.4(36)	-17.9
64	32.3 +/- 9.6(43)	22.6 +/- 4.7(39)	-30.0	27.5 +/- 7.3(46)	-14.9	25.8 +/- 4.1(38)	-20.1	27.4 +/- 6.3(43)	-15.2	23.8 +/- 5.7(36)	-26.3
68	27.4 +/- 7.4(42)	22.9 +/- 4.5(42)	-16.4	17.3 +/- 5.8(39)	-36.9	29.0 +/- 13.6(40)	5.8	23.6 +/- 4.4(45)	-13.9	26.0 +/- 4.7(34)	-5.1
72	26.3 +/- 9.9(39)	22.6 +/- 5.6(42)	-14.1	22.8 +/- 7.1(37)	-13.3	25.6 +/- 8.4(36)	-2.7	22.4 +/- 5.5(44)	-14.8	20.5 +/- 7.3(37)	-22.1
76	25.9 +/- 7.7(36)	23.5 +/- 6.4(42)	-9.3	23.1 +/- 7.2(35)	-10.8	24.1 +/- 8.2(35)	-6.9	19.8 +/- 7.2(42)	-23.6	20.0 +/- 4.4(38)	-22.8
80	26.9 +/- 7.9(37)	22.2 +/- 4.5(42)	-17.5	23.5 +/- 8.2(33)	-12.6	26.3 +/- 7.3(36)	-2.2	23.3 +/- 6.3(41)	-13.4	20.4 +/- 5.6(36)	-24.2
84	23.9 +/- 10.8(38)	21.6 +/- 6.3(40)	-9.6	22.1 +/- 6.5(31)	-7.5	26.3 +/- 10.9(30)	10.0	21.9 +/- 4.7(41)	-8.4	19.6 +/- 5.2(32)	-18.0
88	28.7 +/- 17.9(33)	21.5 +/- 5.6(35)	-25.1	20.8 +/- 8.9(30)	-27.5	23.8 +/- 8.3(29)	-17.1	19.4 +/- 6.0(34)	-32.4	16.5 +/- 8.7(36)	-42.5
92	28.3 +/- 15.2(29)	19.4 +/- 7.9(33)	-31.4	22.0 +/- 8.3(27)	-22.3	24.4 +/- 6.1(29)	-13.8	22.0 +/- 7.4(31)	-22.3	20.3 +/- 6.4(26)	-28.3
96	26.5 +/- 7.2(24)	31.5 +/- 9.7(30)	18.9	22.8 +/- 7.5(28)	-14.0	28.0 +/- 13.4(29)	5.7	21.0 +/- 7.1(27)	-20.8	19.8 +/- 8.6(26)	-25.3
100	33.7 +/- 16.5(27)	19.3 +/- 5.4(32)	-42.7	25.2 +/- 12.4(25)	-25.2	30.2 +/- 14.1(27)	-10.4	21.1 +/- 8.0(22)	-37.4	20.8 +/- 8.0(21)	-38.3
MEAN	24.9	21.2	-14.1	20.7	-16.3	23.6	-3.8	20.0	-19.1	19.6	-20.6

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a % Change from control.
b Mean ± S.D. (n).

TABLE 8-2

MIDWEST RESEARCH INSTITUTE
EFFECTS OF INHALED 1,2-DICHLOROETHANE IN RATS TREATED WITH DISULFIRAM OR ETHANOL
FEED CONSUMPTION (g) FEMALE RATS

WEEK	CONTROL	DS	% C[a]	ET	% C	EDC	% C	EDC/DS	% C	EDC/ET	% C
1	14.8 +/- 5.1(50)[b]	12.7 +/- 4.2(50)	-14.2	14.5 +/- 1.5(50)	-2.0	15.2 +/- 1.9(50)	2.7	11.0 +/- 2.6(50)	-25.7	15.0 +/- 1.5(50)	1.4
2	12.2 +/- 5.2(50)	12.4 +/- 2.1(50)	1.6	10.4 +/- 1.5(50)	-14.8	12.6 +/- 1.8(50)	3.3	11.9 +/- 2.2(50)	-2.5	10.7 +/- 1.5(50)	-12.3
3	17.5 +/- 11.9(50)	13.2 +/- 5.0(50)	-24.6	13.5 +/- 2.6(50)	-22.9	14.5 +/- 5.6(50)	-17.1	12.7 +/- 2.7(50)	-27.4	12.6 +/- 2.3(50)	-28.0
4	14.2 +/- 3.0(50)	11.8 +/- 4.2(50)	-16.9	12.5 +/- 3.1(50)	-12.0	14.9 +/- 2.4(50)	4.9	8.6 +/- 4.6(50)	-39.4	13.0 +/- 3.3(50)	-8.5
5	16.8 +/- 3.5(50)	17.8 +/- 6.0(50)	6.0	13.4 +/- 1.8(50)	-20.2	16.6 +/- 6.0(50)	-1.2	13.1 +/- 2.7(50)	-22.0	13.4 +/- 2.2(49)	-20.2
6	13.2 +/- 6.6(50)	11.2 +/- 4.5(50)	-15.2	12.7 +/- 6.4(50)	-3.8	13.7 +/- 6.1(50)	3.8	12.0 +/- 3.5(50)	-9.1	13.5 +/- 4.2(49)	2.3
7	14.9 +/- 2.6(50)	14.2 +/- 8.1(50)	-4.7	12.6 +/- 2.2(50)	-15.4	19.6 +/- 7.8(50)	31.5	12.6 +/- 2.7(50)	-15.4	12.3 +/- 2.1(49)	-17.4
8	13.1 +/- 3.6(50)	10.1 +/- 3.5(50)	-22.9	9.7 +/- 3.4(50)	-26.0	13.1 +/- 9.4(50)	0.0	10.8 +/- 3.7(50)	-17.6	8.7 +/- 4.6(49)	-33.6
9	15.3 +/- 2.5(50)	12.1 +/- 2.8(50)	-20.9	13.0 +/- 3.7(50)	-15.0	16.3 +/- 5.2(50)	6.5	11.5 +/- 4.2(50)	-24.8	10.9 +/- 4.2(49)	-28.8
10	14.5 +/- 4.2(50)	11.7 +/- 2.0(50)	-19.3	11.7 +/- 2.7(50)	-19.3	15.2 +/- 4.1(50)	4.8	15.2 +/- 9.6(50)	4.8	13.0 +/- 2.0(49)	-10.3
11	13.1 +/- 2.8(50)	13.3 +/- 3.6(50)	1.5	11.9 +/- 2.5(50)	-9.2	19.2 +/- 10.6(50)	46.6	13.2 +/- 2.9(50)	0.8	14.7 +/- 3.4(49)	12.2
12	15.5 +/- 2.7(50)	13.6 +/- 3.2(50)	-12.3	13.2 +/- 1.9(50)	-14.8	16.8 +/- 8.6(50)	8.4	13.3 +/- 2.4(50)	-14.2	13.5 +/- 2.7(49)	-12.9
14	15.4 +/- 3.6(50)	14.9 +/- 8.2(50)	-3.2	12.8 +/- 3.1(50)	-16.9	9.0 +/- 7.9(50)	-41.6	9.6 +/- 11.7(50)	-37.7	8.9 +/- 4.9(49)	-42.2
16	17.9 +/- 5.4(50)	12.7 +/- 2.5(50)	-29.1	11.1 +/- 2.5(50)	-38.0	18.6 +/- 8.6(50)	3.9	15.8 +/- 4.0(50)	-11.7	14.8 +/- 7.0(49)	-17.3
18	17.6 +/- 5.9(50)	12.9 +/- 5.3(50)	-26.7	12.0 +/- 3.6(50)	-31.8	17.4 +/- 7.7(50)	-1.1	12.5 +/- 5.0(50)	-29.0	13.7 +/- 2.7(49)	-22.2
20	16.3 +/- 2.9(50)	14.2 +/- 4.9(50)	-12.9	13.5 +/- 4.1(50)	-17.2	14.8 +/- 3.5(50)	-9.2	14.0 +/- 3.2(50)	-14.1	14.6 +/- 10.9(49)	-10.4
22	16.1 +/- 2.2(50)	13.4 +/- 2.6(50)	-16.8	14.0 +/- 4.0(50)	-13.0	16.5 +/- 6.4(50)	2.5	12.5 +/- 1.9(50)	-22.4	12.9 +/- 3.3(49)	-19.9
24	14.9 +/- 2.3(50)	13.1 +/- 1.4(50)	-12.1	13.2 +/- 3.3(50)	-11.4	16.3 +/- 4.2(50)	9.4	13.3 +/- 2.4(50)	-10.7	14.1 +/- 6.7(49)	-5.4
28	15.6 +/- 3.5(50)	12.4 +/- 2.2(50)	-20.5	13.8 +/- 4.2(50)	-11.5	15.7 +/- 5.3(50)	0.6	12.5 +/- 2.1(50)	-19.9	13.5 +/- 3.6(49)	-13.5
32	31.9 +/- 14.2(50)	20.3 +/- 6.0(50)	-36.4	30.0 +/- 11.8(50)	-6.0	25.5 +/- 10.4(50)	-20.1	23.3 +/- 8.0(50)	-27.0	26.2 +/- 15.0(49)	-17.9
36	17.8 +/- 3.7(47)	14.1 +/- 2.5(50)	-20.8	14.5 +/- 3.0(50)	-18.5	17.2 +/- 4.7(48)	-3.4	14.8 +/- 2.5(47)	-16.9	13.4 +/- 1.9(47)	-24.7
40	16.9 +/- 3.9(49)	12.5 +/- 3.0(49)	-26.0	14.4 +/- 2.8(49)	-14.8	14.9 +/- 4.7(50)	-11.8	14.9 +/- 4.8(50)	-11.8	12.6 +/- 2.5(48)	-25.4
44	18.4 +/- 3.4(50)	14.4 +/- 3.3(49)	-21.7	15.0 +/- 3.5(49)	-18.5	16.2 +/- 2.7(50)	-12.0	14.9 +/- 3.1(50)	-19.0	13.4 +/- 2.0(46)	-27.2
48	17.3 +/- 3.8(47)	15.1 +/- 2.3(48)	-12.7	12.4 +/- 4.4(50)	-28.3	15.7 +/- 3.1(46)	-9.2	14.6 +/- 2.4(50)	-15.6	11.8 +/- 2.9(47)	-31.8
52	19.5 +/- 4.5(50)	15.7 +/- 4.4(50)	-19.5	15.6 +/- 3.7(49)	-20.0	17.6 +/- 4.1(46)	-9.7	15.7 +/- 2.9(49)	-19.5	15.7 +/- 5.6(46)	-19.5
56	17.8 +/- 3.5(49)	15.3 +/- 3.1(50)	-14.0	13.8 +/- 5.1(44)	-22.5	16.0 +/- 3.2(43)	-10.1	14.1 +/- 2.2(47)	-20.8	12.9 +/- 3.0(44)	-27.5
61	21.2 +/- 7.3(48)	16.4 +/- 3.6(49)	-22.6	18.0 +/- 5.8(45)	-15.1	17.4 +/- 3.1(46)	-17.9	14.6 +/- 2.5(49)	-31.1	14.8 +/- 5.0(43)	-30.2
64	26.7 +/- 7.3(45)	13.9 +/- 3.5(46)	-47.9	21.3 +/- 5.9(45)	-20.2	20.7 +/- 4.7(43)	-22.5	19.0 +/- 5.3(47)	-28.8	17.5 +/- 3.3(43)	-34.5
68	16.8 +/- 4.9(45)	14.6 +/- 3.7(48)	-13.1	14.0 +/- 3.7(44)	-16.7	23.1 +/- 10.6(44)	37.5	16.3 +/- 3.3(45)	-3.0	18.9 +/- 5.2(42)	12.5
72	19.2 +/- 6.2(42)	14.0 +/- 2.7(45)	-27.1	14.8 +/- 4.5(39)	-22.9	18.4 +/- 9.9(44)	-4.2	15.1 +/- 3.4(46)	-21.4	14.6 +/- 3.8(41)	-24.0
76	19.5 +/- 6.1(38)	15.2 +/- 4.9(47)	-22.1	15.1 +/- 5.1(35)	-22.6	18.9 +/- 8.3(40)	-3.1	16.2 +/- 5.5(38)	-16.9	15.2 +/- 4.4(45)	-22.1
80	20.7 +/- 6.7(37)	15.3 +/- 4.2(44)	-26.1	14.0 +/- 4.2(35)	-32.4	19.1 +/- 5.7(37)	-7.7	16.7 +/- 3.3(39)	-19.3	13.9 +/- 3.7(40)	-32.9
84	23.0 +/- 8.7(37)	13.7 +/- 3.6(39)	-40.4	18.8 +/- 11.3(37)	-18.3	19.1 +/- 9.8(33)	-17.0	15.0 +/- 3.4(36)	-34.8	17.4 +/- 8.6(38)	-24.3
88	22.3 +/- 14.3(32)	16.0 +/- 3.4(39)	-28.3	17.0 +/- 9.0(32)	-23.8	19.3 +/- 9.6(33)	-13.5	16.1 +/- 3.9(33)	-27.8	11.4 +/- 6.1(33)	-48.9
92	22.2 +/- 12.6(35)	15.3 +/- 4.9(36)	-31.1	15.2 +/- 4.1(26)	-31.5	17.9 +/- 6.2(30)	-19.4	15.5 +/- 4.5(30)	-30.2	16.1 +/- 5.7(31)	-27.5
96	23.1 +/- 7.5(28)	22.8 +/- 10.2(34)	-1.3	18.0 +/- 6.8(25)	-22.1	20.6 +/- 6.7(28)	-10.8	20.9 +/- 8.2(27)	-9.5	19.6 +/- 8.2(26)	-15.2
100	26.3 +/- 10.8(26)	13.2 +/- 5.7(33)	-49.8	16.3 +/- 5.0(24)	-38.0	19.8 +/- 10.0(27)	-24.7	17.5 +/- 4.3(24)	-33.5	32.4 +/- 20.5(24)	23.2
MEAN	18.1	14.2	-19.6	14.5	-19.1	17.1	-3.3	14.4	-19.6	14.6	-18.5

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[a] % Change from control.

[b] Mean ± S.D. (n).

TABLE 8-3

MIDWEST RESEARCH INSTITUTE
EFFECTS OF INHALED 1.2-DICHLOROETHANE IN RATS TREATED WITH DISULFIRAM OR ETHANOL
WATER CONSUMPTION (g) MALE RATS

WEEK	CONTROL	DS	% C[a]	ET	% C	EDC	% C	EDC/DS	% C	EDC/ET	% C
1	39.2 +/- 18.4(50)[b]	29.1 +/- 7.0(50)	-25.8	39.4 +/- 12.7(50)	0.5	37.1 +/- 6.5(50)	-5.4	34.4 +/- 18.9(50)	-12.2	38.1 +/- 10.0(50)	-2.8
2	30.0 +/- 5.6(50)	29.7 +/- 7.8(50)	-1.0	30.1 +/- 5.2(50)	0.3	34.1 +/- 4.9(50)	13.7	34.6 +/- 6.9(50)	15.3	31.9 +/- 3.3(50)	6.3
3	40.7 +/- 6.7(50)	42.3 +/- 15.9(50)	3.9	36.6 +/- 9.2(50)	-10.1	46.1 +/- 11.0(50)	13.3	40.9 +/- 17.7(50)	0.5	42.4 +/- 7.7(50)	4.2
4	48.0 +/- 18.0(50)	45.8 +/- 12.9(50)	-4.6	48.9 +/- 13.2(50)	1.9	46.3 +/- 20.7(50)	-3.5	55.6 +/- 16.6(50)	15.8	49.2 +/- 14.1(50)	2.5
5	43.4 +/- 9.3(49)	46.0 +/- 13.0(50)	6.0	43.2 +/- 7.3(50)	-.5	46.1 +/- 9.8(50)	6.2	56.3 +/- 15.8(50)	29.7	38.8 +/- 13.5(49)	-10.6
6	43.6 +/- 10.1(49)	44.9 +/- 19.7(50)	3.0	45.4 +/- 10.2(50)	4.1	48.1 +/- 18.7(50)	10.3	56.7 +/- 20.2(50)	30.0	47.8 +/- 9.2(49)	9.6
7	46.6 +/- 9.1(49)	48.0 +/- 19.9(50)	3.0	45.2 +/- 8.6(50)	-3.0	50.2 +/- 15.2(50)	7.7	59.1 +/- 17.8(50)	26.8	53.1 +/- 13.2(49)	13.9
8	49.4 +/- 13.7(49)	50.7 +/- 15.7(50)	2.6	47.8 +/- 9.5(50)	-3.2	46.2 +/- 12.9(50)	-6.5	67.0 +/- 22.9(50)	35.6	56.4 +/- 12.4(49)	14.2
9	49.4 +/- 14.1(49)	48.8 +/- 17.8(50)	-1.2	48.4 +/- 9.8(50)	-2.0	50.4 +/- 11.2(50)	2.0	62.9 +/- 18.2(50)	27.3	54.8 +/- 10.0(49)	10.9
10	46.8 +/- 13.8(49)	43.7 +/- 16.0(50)	-6.6	42.9 +/- 10.7(50)	-8.3	51.3 +/- 15.6(50)	9.6	57.0 +/- 21.2(50)	21.8	56.1 +/- 16.7(49)	19.9
11	43.6 +/- 12.8(49)	45.7 +/- 19.8(50)	4.8	46.8 +/- 9.6(50)	7.3	46.2 +/- 10.9(50)	6.0	65.3 +/- 24.2(50)	49.8	51.2 +/- 12.7(49)	17.4
12	47.1 +/- 13.1(49)	47.9 +/- 14.1(50)	1.7	54.9 +/- 12.4(50)	16.6	49.2 +/- 12.0(50)	4.5	63.9 +/- 21.1(50)	35.7	55.9 +/- 10.3(49)	18.7
14	43.4 +/- 9.4(49)	45.1 +/- 12.2(50)	3.9	52.5 +/- 12.9(50)	21.0	49.0 +/- 14.1(50)	12.9	62.0 +/- 21.1(50)	42.9	56.6 +/- 10.6(49)	30.4
16	46.5 +/- 10.7(47)	49.5 +/- 13.4(50)	6.5	49.4 +/- 11.1(50)	6.2	46.9 +/- 15.0(50)	0.9	66.1 +/- 21.5(50)	42.2	52.8 +/- 11.0(49)	13.5
18	43.9 +/- 9.9(49)	45.0 +/- 12.9(50)	2.5	52.0 +/- 13.2(50)	18.5	43.7 +/- 8.4(50)	-.5	64.6 +/- 23.1(50)	47.2	50.4 +/- 9.5(49)	14.8
20	50.0 +/- 17.6(49)	47.9 +/- 12.4(50)	-4.2	53.2 +/- 13.0(50)	6.4	47.2 +/- 9.3(50)	-5.6	59.0 +/- 16.7(50)	18.0	53.6 +/- 16.7(49)	7.2
22	44.6 +/- 16.4(49)	46.6 +/- 17.2(50)	4.5	50.6 +/- 15.4(50)	13.5	45.3 +/- 8.7(50)	1.6	56.9 +/- 18.4(50)	27.6	56.1 +/- 13.2(49)	25.8
24	41.7 +/- 9.7(49)	49.1 +/- 13.0(50)	17.7	49.0 +/- 15.3(50)	17.5	57.6 +/- 20.1(50)	38.1	63.3 +/- 18.0(50)	51.8	54.4 +/- 11.3(49)	30.5
28	43.4 +/- 22.9(49)	48.9 +/- 14.4(50)	12.7	57.0 +/- 18.4(50)	31.3	47.3 +/- 10.8(49)	9.0	60.5 +/- 21.6(50)	39.4	59.8 +/- 17.7(49)	37.8
32	38.5 +/- 11.5(49)	48.1 +/- 14.0(50)	24.9	45.7 +/- 14.6(50)	18.7	45.8 +/- 11.0(49)	19.0	57.0 +/- 18.1(50)	48.1	49.7 +/- 17.1(49)	29.1
36	37.3 +/- 8.0(49)	47.5 +/- 11.3(50)	27.3	48.1 +/- 12.2(49)	29.0	45.9 +/- 9.5(49)	23.1	55.2 +/- 15.4(50)	48.0	52.8 +/- 12.8(49)	41.6
40	34.9 +/- 14.4(49)	40.7 +/- 12.8(50)	16.6	50.3 +/- 16.1(48)	44.1	42.9 +/- 9.7(49)	22.9	54.4 +/- 19.5(48)	55.9	57.7 +/- 19.3(49)	65.3
44	38.5 +/- 8.1(48)	49.9 +/- 11.7(48)	29.6	48.7 +/- 12.0(46)	26.5	48.6 +/- 9.9(48)	26.2	55.5 +/- 12.9(44)	44.2	53.6 +/- 12.2(46)	39.2
48	36.7 +/- 9.9(48)	43.5 +/- 10.3(50)	18.5	49.5 +/- 10.5(46)	34.9	44.9 +/- 10.6(49)	22.3	51.1 +/- 13.5(40)	39.2	54.1 +/- 11.3(45)	47.4
52	38.8 +/- 11.3(48)	47.1 +/- 10.5(50)	21.4	47.8 +/- 11.5(48)	23.2	48.8 +/- 12.4(48)	25.8	56.5 +/- 17.6(46)	45.6	55.2 +/- 12.6(47)	42.3
56	42.5 +/- 9.4(48)	48.7 +/- 10.5(49)	14.6	46.7 +/- 9.6(45)	9.9	50.4 +/- 10.1(46)	18.6	54.3 +/- 12.3(41)	27.8	51.5 +/- 10.8(46)	21.2
61	49.8 +/- 14.0(48)	47.8 +/- 11.2(49)	-4.0	53.1 +/- 11.1(45)	6.6	59.7 +/- 11.1(43)	19.9	55.4 +/- 14.5(40)	11.2	63.3 +/- 12.6(45)	27.1
64	42.9 +/- 10.3(48)	56.0 +/- 12.9(48)	30.5	51.8 +/- 11.4(48)	20.7	52.7 +/- 12.0(46)	22.8	60.0 +/- 11.6(38)	39.9	55.6 +/- 10.0(41)	29.6
68	43.3 +/- 10.1(47)	50.0 +/- 13.2(48)	15.5	50.9 +/- 11.7(47)	17.6	47.2 +/- 13.3(46)	9.0	54.9 +/- 13.2(41)	26.8	50.9 +/- 12.9(41)	17.6
72	40.4 +/- 14.2(46)	49.7 +/- 7.7(45)	23.0	48.4 +/- 14.5(44)	19.8	55.1 +/- 12.2(42)	36.4	53.4 +/- 12.6(42)	32.2	50.9 +/- 13.0(42)	26.0
76	39.6 +/- 14.0(46)	45.6 +/- 10.3(47)	15.2	47.9 +/- 10.9(40)	21.0	50.0 +/- 9.9(38)	26.3	49.3 +/- 14.3(37)	24.5	53.0 +/- 10.1(39)	33.8
80	42.4 +/- 12.2(43)	46.6 +/- 9.3(44)	9.9	48.1 +/- 10.9(39)	13.4	50.3 +/- 11.7(31)	18.6	51.2 +/- 10.0(36)	20.8	51.4 +/- 9.9(37)	21.2
84	45.5 +/- 13.1(42)	45.5 +/- 12.5(41)	0.0	57.3 +/- 14.3(39)	25.9	54.6 +/- 8.8(32)	20.0	51.9 +/- 12.4(35)	14.1	63.1 +/- 17.1(37)	38.7
88	34.9 +/- 11.0(33)	43.7 +/- 9.2(40)	25.2	43.3 +/- 13.7(33)	24.1	47.4 +/- 11.9(36)	35.8	48.4 +/- 14.2(30)	38.7	48.5 +/- 9.6(32)	39.0
92	41.0 +/- 15.0(30)	46.2 +/- 10.6(36)	12.7	51.3 +/- 10.5(27)	25.1	53.3 +/- 11.1(31)	30.0	45.3 +/- 14.6(25)	10.5	47.2 +/- 11.7(26)	15.1
96	38.7 +/- 13.0(27)	45.7 +/- 10.0(34)	18.1	50.3 +/- 13.4(28)	30.0	52.5 +/- 13.3(25)	35.7	44.7 +/- 15.6(22)	15.5	51.4 +/- 12.0(25)	32.8
100	39.7 +/- 12.9(28)	40.1 +/- 13.2(35)	1.0	50.4 +/- 10.7(26)	27.0	51.4 +/- 14.2(24)	29.5	45.8 +/- 10.5(20)	15.4	47.1 +/- 14.0(21)	18.6
MEAN	42.3	45.9	8.9	48.2	14.5	48.4	15.0	54.9	29.8	51.8	23.0

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a % Change from control.
b Mean ± S.D. (n).

TABLE 8-4

MIDWEST RESEARCH INSTITUTE
EFFECTS OF INHALED 1,2-DICHLOROETHANE IN RATS TREATED WITH DISULFIRAM OR ETHANOL
WATER CONSUMPTION (g) FEMALE RATS

WEEK	CONTROL	DS	% C[a]	ET	% C	EDC	% C	EDC/DS	% C	EDC/ET	% C
1	33.4 +/- 18.3(50)[b]	31.0 +/- 8.1(50)	-7.2	31.6 +/- 7.4(50)	-5.4	40.6 +/- 20.4(50)	21.6	31.5 +/- 9.4(50)	-5.7	38.6 +/- 15.0(50)	15.6
2	25.5 +/- 8.7(50)	32.6 +/- 15.3(50)	27.8	26.6 +/- 10.0(50)	4.3	37.9 +/- 42.5(50)	48.6	31.2 +/- 8.1(50)	22.4	26.5 +/- 4.4(50)	3.9
3	34.6 +/- 12.2(50)	34.9 +/- 14.0(50)	0.9	34.6 +/- 10.8(50)	0.0	36.1 +/- 7.7(50)	4.3	38.4 +/- 13.9(50)	11.0	38.4 +/- 18.0(50)	11.0
4	38.4 +/- 12.6(50)	34.5 +/- 20.0(50)	-10.2	41.4 +/- 11.8(50)	7.8	38.1 +/- 8.2(50)	-.8	40.5 +/- 11.0(50)	5.5	42.3 +/- 18.3(50)	10.2
5	37.7 +/- 13.5(50)	42.2 +/- 23.8(50)	11.9	37.0 +/- 10.8(50)	-1.9	43.9 +/- 15.7(50)	16.4	40.4 +/- 11.3(50)	7.2	37.5 +/- 16.7(49)	-.5
6	36.4 +/- 11.3(50)	38.1 +/- 17.2(50)	4.7	37.6 +/- 10.6(50)	3.3	38.3 +/- 9.7(50)	5.2	41.3 +/- 14.8(50)	13.5	42.7 +/- 14.8(49)	17.3
7	40.0 +/- 12.0(50)	39.2 +/- 15.0(50)	-2.0	43.6 +/- 16.7(50)	9.0	45.9 +/- 19.3(50)	14.8	45.1 +/- 25.0(50)	12.8	35.6 +/- 14.4(49)	-11.0
8	44.3 +/- 15.4(50)	43.7 +/- 19.0(50)	-1.4	45.2 +/- 15.2(50)	2.0	45.7 +/- 17.5(50)	3.2	43.5 +/- 23.9(50)	-1.8	48.1 +/- 17.3(49)	8.6
9	43.1 +/- 17.8(50)	43.7 +/- 17.7(50)	1.4	43.8 +/- 13.4(50)	1.6	44.3 +/- 16.2(50)	2.8	48.4 +/- 14.8(50)	12.3	45.4 +/- 14.8(49)	5.3
10	36.2 +/- 10.9(50)	44.5 +/- 23.8(50)	22.9	41.9 +/- 16.4(50)	15.7	47.5 +/- 14.8(50)	31.2	40.0 +/- 16.6(50)	10.5	47.2 +/- 14.8(49)	30.4
11	38.5 +/- 14.3(50)	39.8 +/- 21.0(50)	3.4	39.9 +/- 15.7(50)	3.6	43.5 +/- 14.8(50)	13.0	49.6 +/- 19.6(50)	28.8	43.5 +/- 12.9(49)	13.0
12	42.4 +/- 15.7(50)	41.1 +/- 12.2(50)	-3.1	45.5 +/- 12.3(50)	7.3	44.9 +/- 16.9(50)	5.9	48.4 +/- 13.3(50)	14.2	45.8 +/- 15.1(49)	8.0
14	38.4 +/- 11.6(50)	43.4 +/- 15.4(50)	13.0	42.9 +/- 9.5(50)	11.7	42.1 +/- 22.5(50)	9.6	43.7 +/- 15.7(50)	13.8	43.2 +/- 14.0(49)	12.5
16	37.5 +/- 9.6(50)	42.3 +/- 12.9(50)	12.8	41.5 +/- 12.6(50)	10.7	43.2 +/- 12.5(50)	15.2	47.8 +/- 17.4(50)	27.5	43.7 +/- 14.0(49)	16.5
18	37.6 +/- 11.1(50)	39.8 +/- 22.2(50)	5.9	42.1 +/- 10.5(50)	12.0	42.4 +/- 11.7(50)	12.8	45.5 +/- 15.1(50)	21.0	47.8 +/- 14.0(49)	27.1
20	40.8 +/- 13.2(50)	40.1 +/- 12.0(50)	-1.7	48.5 +/- 14.5(50)	18.9	46.3 +/- 17.4(50)	13.5	46.8 +/- 18.5(50)	14.7	47.7 +/- 14.6(49)	16.9
22	39.5 +/- 12.5(50)	39.6 +/- 13.9(50)	2.9	41.5 +/- 12.1(50)	7.8	42.2 +/- 17.8(50)	9.6	42.3 +/- 14.7(50)	9.9	48.9 +/- 16.1(49)	27.0
24	36.5 +/- 11.3(50)	40.3 +/- 14.3(50)	10.4	45.8 +/- 11.5(50)	25.5	42.5 +/- 13.9(50)	16.4	42.5 +/- 11.5(50)	16.4	49.4 +/- 14.3(49)	35.3
28	40.5 +/- 14.0(50)	46.5 +/- 21.5(50)	14.8	50.0 +/- 14.5(50)	23.5	50.9 +/- 22.8(50)	25.7	50.3 +/- 24.3(49)	24.2	51.4 +/- 14.1(49)	26.9
32	37.4 +/- 10.6(50)	39.2 +/- 13.1(50)	4.8	43.2 +/- 14.6(50)	15.5	48.6 +/- 22.8(50)	29.9	43.9 +/- 13.1(50)	17.4	50.0 +/- 16.6(49)	33.7
36	39.9 +/- 12.7(50)	39.9 +/- 12.6(50)	0.0	51.4 +/- 18.2(50)	28.8	46.8 +/- 17.0(50)	17.3	47.8 +/- 12.4(50)	19.8	58.0 +/- 19.7(49)	45.4
40	35.7 +/- 18.4(50)	35.0 +/- 11.3(50)	-2.0	45.7 +/- 18.5(50)	28.0	45.3 +/- 17.9(49)	26.9	43.9 +/- 15.2(50)	23.0	50.6 +/- 16.9(49)	41.7
44	39.4 +/- 10.3(49)	41.3 +/- 12.4(50)	4.8	55.1 +/- 13.8(50)	39.8	45.8 +/- 11.0(47)	16.2	49.0 +/- 12.7(49)	24.4	53.6 +/- 11.0(45)	36.0
48	40.1 +/- 10.6(49)	40.2 +/- 12.2(49)	0.2	50.8 +/- 12.5(49)	26.7	45.7 +/- 14.4(47)	14.0	47.6 +/- 13.1(46)	18.7	53.4 +/- 13.2(46)	33.2
52	45.8 +/- 11.4(50)	47.1 +/- 16.2(49)	2.8	51.0 +/- 13.6(48)	11.4	50.5 +/- 14.8(49)	10.3	47.2 +/- 14.2(48)	3.1	53.6 +/- 14.0(48)	17.0
56	43.4 +/- 11.2(49)	46.0 +/- 13.2(48)	6.0	47.9 +/- 16.6(41)	10.4	51.0 +/- 13.1(47)	17.5	50.3 +/- 13.5(47)	15.9	52.7 +/- 12.7(44)	21.4
61	51.9 +/- 13.7(47)	43.7 +/- 13.9(47)	-15.8	52.5 +/- 15.0(15)	1.2	56.6 +/- 12.5(42)	9.1	51.1 +/- 13.6(48)	-1.5	61.1 +/- 15.6(46)	17.7
64	44.4 +/- 14.3(48)	52.0 +/- 11.1(45)	17.1	49.2 +/- 12.6(43)	10.8	54.2 +/- 11.3(45)	22.1	56.2 +/- 12.2(41)	26.6	56.2 +/- 12.4(44)	26.6
68	44.1 +/- 10.9(46)	46.1 +/- 16.7(45)	4.5	51.6 +/- 14.4(44)	17.0	47.6 +/- 12.4(46)	7.9	50.3 +/- 12.6(44)	14.1	51.9 +/- 12.4(45)	17.7
72	47.5 +/- 14.2(44)	46.3 +/- 13.4(48)	-2.5	49.9 +/- 14.6(39)	5.1	47.1 +/- 12.5(43)	-.8	52.0 +/- 13.0(41)	9.5	53.0 +/- 13.2(45)	11.6
76	43.3 +/- 9.6(42)	40.7 +/- 10.9(46)	-6.0	48.6 +/- 11.6(35)	12.2	48.6 +/- 10.6(38)	12.2	46.7 +/- 10.2(35)	7.9	50.0 +/- 11.2(40)	15.5
80	41.2 +/- 12.3(40)	39.5 +/- 11.0(40)	-4.1	43.0 +/- 11.4(35)	4.4	50.4 +/- 10.2(36)	22.3	49.4 +/- 8.5(32)	19.9	47.8 +/- 12.5(31)	16.0
84	46.9 +/- 11.4(36)	40.0 +/- 13.1(38)	-14.7	53.0 +/- 15.2(37)	13.0	49.6 +/- 10.2(32)	5.8	46.9 +/- 12.1(33)	0.0	59.6 +/- 17.3(41)	27.1
88	41.9 +/- 13.7(37)	38.3 +/- 10.4(39)	-8.6	49.5 +/- 11.5(32)	15.8	43.6 +/- 13.1(34)	4.1	47.9 +/- 9.8(29)	14.3	47.9 +/- 11.4(34)	14.3
92	39.7 +/- 12.2(35)	39.1 +/- 12.8(35)	-1.5	48.7 +/- 11.0(23)	22.7	44.7 +/- 11.0(31)	12.6	46.0 +/- 8.2(26)	15.9	51.6 +/- 8.6(22)	30.0
96	43.7 +/- 14.3(28)	38.8 +/- 13.1(32)	-11.2	45.6 +/- 12.9(26)	4.3	46.0 +/- 13.5(26)	5.3	49.9 +/- 10.2(25)	14.2	46.3 +/- 13.7(21)	5.9
100	45.8 +/- 13.8(26)	38.0 +/- 12.0(32)	-15.3	48.5 +/- 10.3(26)	5.9	46.5 +/- 11.5(27)	1.5	49.3 +/- 10.9(23)	7.6	52.6 +/- 11.4(23)	14.8
MEAN	40.3	40.8	1.8	45.0	11.6	45.5	13.6	45.7	13.8	47.9	18.9

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a % Change from control.
b Mean ± S.D. (n).

APPENDIX 9

HISTOPATHOLOGY NARRATIVE AND SUMMARY REPORT
(PATHOLOGY ASSOCIATES, INC.)

PATHOLOGY REPORT

PATHOLOGY ASSOCIATES, INC.

WORK ASSIGNMENT EDC
SPRAGUE-DAWLEY RATS
MRI/NIOSH

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I. QUALITY ASSURANCE STATEMENT

QUALITY ASSURANCE STATEMENT

This histopathology project has been conducted in compliance with Good Laboratory Practices regulations promulgated by the U.S. Food and Drug Administration. Pathology Associates, Incorporated has a functioning and responsive quality assurance unit which has conducted appropriate inspections and reported all findings to management. The following is a record of those inspections and reports:

Date of Inspection	Phase Inspected	Date Findings Reported To Management and Study Director
November 13, 1984	Trimming	November 15, 1984
November 13, 1984	Cutting	November 15, 1984
December 5, 1984	Processing	December 8, 1984
December 5, 1984	Embedding	December 8, 1984
December 5, 1984	Staining	December 8, 1984
December 5, 1984	Coverslipping and labeling	December 8, 1984
February 4, 1985	Quality Control	February 4, 1985
March 20, 1985	Data	March 22, 1985
March 27, 1985	Final Report	March 27, 1985

Director, Quality Assurance Unit

03-27-85

Date

EDC Chronic Study in Rats

II. PATHOLOGY NARRATIVE

Carcinogenicity and Toxicity of Inhaled 1,2-Dichloroethane in Rats Treated with Disulfiram or Ethanol: Report of Histopathological Findings

INTRODUCTION

This study was initiated to determine the potential carcinogenicity of 1,2-dichloroethane (EDC) in Sprague-Dawley rats alone and in combination with disulfiram (DS) or ethanol (ET). Animals were exposed to EDC vapors via the inhalation route since it represents the major route of human exposure. This report represents the result of the histological examinations.

MATERIALS AND METHODS

Groups of 50 Sprague-Dawley rats of each sex were exposed to either EDC atmospheres of 50 ppm or filtered air 7 hours/day, 5 days/week excluding holidays for 24 months. During non-exposure periods, all animals were housed in chambers and received filtered air. The EDC inhalation groups, with or without concomitant exposure to either 5.0% ethanol in the drinking water or 0.05% disulfiram in feed, were as follows:

Group No. (Designation)	EDC	Diet	Water
1 (CONTROL)	Filtered air	Standard diet	Drinking water
2 (DS)	Filtered air	0.05% disulfiram	Drinking water
3 (ET)	Filtered air	Standard diet	5% ethanol
4 (EDC/DS)	50 ppm	0.05% disulfiram	Drinking water
5 (EDC)	50 ppm	Standard diet	Drinking water
6 (EDC/ET)	50 ppm	Standard diet	5% ethanol

All animals that died, killed when moribund or survived to 105 weeks, were given a complete necropsy examination. The following organs and tissues were examined grossly and fixed in 10% neutral buffered formalin:

Skin, mandibular lymph node, mammary gland, salivary gland, thigh muscle, sciatic nerve, sternebrae, vertebrae or femur including marrow, costochrondral junction, rib, thymus, larynx and pharynx, trachea, lungs and bronchi, heart, thyroid, parathyroids, esophagus, stomach, duodenum, jejunum, ileum, colon, cecum, rectum, mesenteric lymph node, liver, pancreas, spleen, kidneys, adrenals, urinary bladder, seminal vesicles, prostate, testes, ovaries, uterus, nasal cavity and nasal turbinates, brain, pituitary, spinal cord, eyes, tissue masses, suspect tumors and regional lymph nodes and all other gross lesions.

The following organs and tissues were trimmed, processed through paraffin, sectioned at 5-6 microns, stained with hematoxylin and eosin, and examined microscopically:

Pituitary, brain, heart, thyroid, parathyroid, trachea, esophagus, spleen, liver, lung, pancreas, salivary gland, mandibular lymph node, thymus, kidney, adrenal gland, mammary gland, urinary bladder, forestomach, glandular stomach, small intestine, colon, mesenteric lymph node, ovary, uterus, testes, prostate, bone, bone marrow, nasal cavity/mucous membrane, larynx, skin, subcutis, as well as all gross lesions and tissue masses.

Systematized nomenclature of medicine (SNOMED) terminology was used and modified to include terminology for certain lesions unique to rodents. Diagnoses were computerized using the LABCAT program developed by Innovative Programming Associates, Inc. Because of the size of the study and uniqueness of the SNOMED terminology, it was necessary in some cases to modify the sequence in the diagnosis or abbreviate others to permit acceptance by the LABCAT system.

It was the intent to examine each protocol required organ, however, certain organs were lost or were unsuitable because of autolysis. Therefore, the total number of organs or tissues examined did not in all cases correspond to the number of animals on test.

Where possible, degenerative and inflammatory lesions were graded 1- minimal, 2- mild, 3- moderate, 4- severe. Certain lesions did not lend themselves to severity grades such as cysts or neoplasms. The LABCAT system did not permit the designation of neoplasms as being bilateral or multiple. These lesions were designated as being multifocal for acceptance by the program.

RESULTS AND DISCUSSION

Female Rats:

Control - A summary of histological findings are tabulated in the Project Summary Table, Incidence of Neoplastic and Non-neoplastic Microscopic Findings.

Organs with a greater than 5 percent incidence of neoplasms included the adrenal gland, mammary gland, pancreas, pituitary gland and uterus. Of these, neoplasms of the pituitary, pars distalis (74%) and mammary gland (42.1%) were the most prevalent. Seventeen (17) of the rats were tumor bearing for one or more mammary neoplasms.

Several common non-neoplastic lesions were encountered. Frequently diagnosed non-neoplastic proliferative lesions included C-cell hyperplasia of the thyroid, focal cellular change in the liver, intrahepatic bile duct proliferation, hematopoietic cell proliferation of the spleen, plasma cell hyperplasia of the mandibular lymph node, focal or multifocal hyperplasia of the adrenal cortex, ovarian stromal hyperplasia and hyperplasia of bone marrow hematopoietic cells.

Common degenerative lesions included cardiomyopathy of the ventricular myocardium, phagocytized pigment in the spleen, retention of content in the mammary gland, chronic nephropathy, calculi of the renal pelvis and associated hyperplasia of the pelvic epithelium, focal atrophy of the exocrine pancreas and hematocysts of the adrenal cortex.

Inflammatory lesions were encountered most frequently in the lung, nasal mucosa and nasolacrimal duct. Lesions of the lung were usually minimal and nasal inflammations were most frequently observed in animals with tooth abscesses.

Compression injury of the hypothalmus, and internal hydrocephalus were frequently associated with pituitary neoplasms. These were sufficiently severe in many cases to have caused death or morbundity.

Another common finding was tooth deformities. This probably represents a developmental malformation. Tooth abscessation was frequently associated.

(DS) - There were fewer mammary neoplasms in rats treated with disulfiram compared with controls. Atlhough of uncertain mechanism, congestion of the mesenteric lymph node was exceedingly prevalent (71%) in the DS group. Chronic nephropathy and calculi of the renal pelvis were of reduced incidence when compared to the control group. The incidences of other neoplastic and non-neoplastic lesions were similar to those encountered in the control group.

ET - This group had neoplastic and non-neoplastic lesions similar to those seen in controls.

EDC/DS - There was a high incidence of cholangiomas (0% control vs 34% treated) of the intrahepatic bile ducts. These were unusual lesions that consisted of a poorly circumscribed proliferation of bile ducts lined by a flattened or low cuboidal epithelium. Biliary epithelial cells rested on a moderately fine connective tissue stroma. These lesions did not appear to be locally invasive and there were no metastases. In addition, bile duct cysts were extremely common (48%) in the livers of this group. The incidence of mammary neoplasms was increased; the combined total of adenomas, adenocarcinomas and fibroadenomas was 71 percent compared to 42 percent in controls. Twenty-five (25) of the rats were tumor bearing for one or more mammary neoplasms. The most significant departure from the control value was mammary adenocarcinoma (8% control vs 25% treated). In addition, fibromas of the subcutis were increased (2% control vs 10% treated). Increased incidence of congestion of the mesenteric lymph node, like that seen with disulfiram treatment alone, was noted in this combination group.

The histopathological observations in the liver were reflected by an increased relative liver weight.

EDC - There was an 8 percent incidence of basophilic foci in the exocrine pancreas. This lesion was uncommon in female rats. It may be EDC related as a few foci were also seen in the EDC/DS (4%) and EDC/ET (2%) groups. This lesion was not observed in controls. However, the numbers of such lesions are too low to attribute significance.

EDC/ET - This group had neoplastic and non-neoplastic lesions similar to those seen in controls.

Male Rats:

Control - A summary of histological findings are tabulated in the Project Summary Table, Incidence of Neoplastic and Non-neoplastic Microscopic Findings.

Organs with a greater than 5 percent background incidence of neoplasms included the adrenal gland, thyroid, endocrine pancreas, and pituitary. Of these, neoplasms of the pituitary pars distalis (63 %), were the most prevalent.

Several common non-neoplastic lesions were encountered. Frequently diagnosed non-neoplastic proliferative lesions included: focal or multifocal hyperplasia of the pituitary pars distalis, C-cell hyperplasia of the thyroid, focal cellular change of the liver, hyperplasia of the intrahepatic bile duct, plasma cell hyperplasia of the mandibular lymph node, focal or multifocal hyperplasia of the adrenal cortex and, hyperplasia of bone marrow hematopoietic cells.

Common degenerative lesions included cardiomyopathy of the ventricular myocardium, focal atrophy of the exocrine pancreas, chronic nephropathy of the kidney, hematocysts of the adrenal cortex and, retention of content in the mammary alveoli and ducts.

Inflammatory lesions were infrequent; chronic interstitial pneumonia and inflammation of the nasal mucosa were found. Lesions of the nasal mucous membranes were frequently related to tooth abscessation.

Compression injury of the hypothalamus and internal hydrocephalus were frequently associated with pituitary neoplasms. These lesions were sufficiently severe in many cases to have caused death or morbundity.

Another common finding was tooth deformities. This probably represents a developmental malformation. Tooth abscessation was frequently associated.

DS - A lesion absent in this group was retention of content in the alveoli and ducts of the mammary gland. Moreover, retention of content was only observed in 3% of the EDC/DS group, indicating a probable DS-related effect. Athough of uncertain mechanism, congestion of the mesenteric lymph node was exceedingly prevelant (64%) in this group. It appears to be DS related as congestion of the mesenteric lymph node was also seen in the EDC/DS group. There was a slight increase in the incidence of chronic interstitial pneumonia. However, there was a decreased incidence of pulmonary alveolar histiocytosis, a related component lesion. For the above reason, this was not considered significant. A similar increase in focal hypertrophy of the adrenal cortex was noted. However, hyperplasia of the adrenal cortex, a related lesion, was decreased. Again the result is considered not biologically significant.

ET - This group had neoplastic and non-neoplastic lesions similar to those seen in controls.

EDC/DS - There was a high incidence of cholangiomas of the intrahepatic duct (18%) compared to none in the controls. These benign lesions were morphologically like those seen and described for females. In addition, bile duct cysts were also common (24%). A 12 percent incidence of neoplastic nodules (hepatocellular adenoma) was also encountered. Although increased, the numbers of such lesions are too low to attribute significance. This represents the only group where hepatocellular neoplasms were increased. An increased incidence of congestion of the mesenteric lymph node (49%), like that seen with DS treatment alone, was noted in this combination group. As noted in the DS group, retention of content in the mammary glands was of low ilncidence (3%) compared with controls (23%).

Interstitial cell tumors of the testis (22% treated vs 4% controls) were noted in this group. This increased incidence confirms the necropsy finding of increased testicular masses.

Fibroma of the subcutis was found in 20 percent of the males compared to 4 percent in controls.

There was no explanation for the increased number of kidney lesions seen at necropsy.

EDC - This group had neoplastic lesions similar to that seen in controls.

There was a 4 percent incidence of neoplastic nodules, an unusual finding in Sprague-Dawley rats. Inasmuch as neoplastic nodules were increased in the EDC/DS male group, it suggests that EDC may be the principal factor in the cause of increased EDC/DS associated hepatocellular neoplasms. An increased incidence of hydronephrosis of the kidney (12% treated vs 2% controls) was also observed.

EDC/ET - This group had neoplastic lesions similar to those seen in controls. There was an 8 percent incidence of neoplastic nodules. With a single hepatocellular carcinoma in the control group this can not be considered significant. However, it supports the premise that EDC may be a potentiator of liver neoplasms. The only non-neoplastic lesion of increased incidence was hydronephrosis (10%) of the kidney. This probably represents biological variation rather than a compound effect.

Cross Sex Comparison of Treated Groups

DS: The only common lesion was congestion of the mesenteric lymph node. This represents an unusual finding and it appears to be a circulatory effect. There was no histological explanation for the reduced body weight. However, reduced body weight has been associated with reduced incidence of neoplasms. This reduced weight gain may explain the reduced incidence of mammary gland neoplasms seen in females of this treatment group.

ET: Both sexes had lesions similar to those seen in their respective controls.

EDC/DS: Morphologically similar cholangiomas of the intrahepatic bile ducts were seen in both sexes of this combination group. Also observed was an increased incidence of subcutaneous fibromas in both sexes although only marginally significant in females. No comparable lesion was seen in females that would be associated with the increased incidence of benign interstitial cell tumors seen in male rats. Neoplastic nodules (hepatocellular adenoma) seen in increased incidence in male rats was not observed in females.

EDC: Although basophilic foci were seen in the exocrine pancreas in both sexes, it could only be considered significant in females.

EDC/ET: The 8% incidence of neoplastic nodules seen in male rats also supports the premise that EDC is the potentiator of hepatocellular neoplasms found to be significant in the EDC/DS group. Other lesions were found in similar incidence to that seen in their respective controls.

CONCLUSION

The EDC/DS combination treatment should be considered carcinogenic for the liver and subcutis as there was a high incidence of intrahepatic bile duct cholangiomas in both male and female rats and neoplastic nodules (hepatocellular adenomas) in male rats utilizing this dosing regimen. Fibromas of the subcutis were also significantly increased in males with the increase in females considered marginally significant. The increased incidence of adenocarcinomas of the mammary gland in female rats is considered a marginal carcinogenic effect.

Robert M Kovach

Robert M. Kovach, D.V.M.
Diplomate, A.C.V.P.

PATHOLOGY ASSOCIATES, INC.

WORK ASSIGNMENT EDC
SPRAGUE-DAWLEY RATS
MRI/NIOSH

Reports Code Table

N	Tissues within normal histological limits
A	Autolysis precluding adequate evaluation
U	Tissues unavailable/unsuitable for evaluation
S	Tissues not applicable to animal
*	Tissues not examined/not required by protocol

1	minimal
2	mild
3	moderate
4	severe
)	focal
]	diffuse
>	multifocal (multiple, bilateral)
P	Present
B	Neoplasm, Benign
M	Neoplasm, Malignant without Metastasis
C	Neoplasm, Malignant with Metastasis
X	Metastatic Site (+)

(End of Report)

ABBREVIATIONS

THE FOLLOWING ABBREVIATIONS WERE USED WHEN SPACE WAS LIMITED:

ACT-CHR. - Active-chronic
ART.- Artery
CA - Carcinoma
CARD. - Cardiac
CART.- Cartilage
CEREB.- Cerebral
CHR. - Chronic
CL. - Cell
CLIT.-Clitoral
COMPRESS.-Compression
CONT.-Content
CORON.-Coronary
ENDOCARD.-Endocarditis
GL.-Gland
HEMATO.-Hematopoietic
HEMORR.-Hemorrhagic
HYPERPL.-Hyperplasia
HYPOTHAL.-Hypothalamus
INFLAM.-Inflammation
INTER.-Internal
L.N.-Lymph Node
MENIN.-Meninges
METAPL.-Metaplasia
MYOCARD.-Myocardium
NOS-Not Otherwise Specified
PEDUN.-Peduncle
PREPUT.-Preputial
PROLIF.-Proliferation
PULMON.-Pulmonary
RETENT.-Retention
SKEL.-Skeletal
SQUAM.-Squamous
SYST.-System
TRACH-BRONCH-Tracheo-bronchial
VEGETAT.-Vegetative

III. PROJECT SUMMARY TABLE

Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

PROJECT ID. NO: EDC FATES: ALL
PAGE 16 DAYS: ALL SEX: FEMALE

GROUP:		CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:		50		49		49		50		50		50	
		#	%	#	%	#	%	#	%	#	%	#	%
PITUITARY	# Ex	50		47		49		43		49		47	
CARCINOMA, NOS, DISTAL		4	(8)	1	(2)	1	(2)	0	(0)	3	(6)	2	(4)
ADENOMA, NOS, DISTAL		37	(74)	38	(81)	33	(67)	25	(58)	35	(71)	39	(83)
HYPERPLASIA, NOS, DISTAL		5	(10)	5	(11)	10	(20)	11	(26)	4	(8)	4	(9)
CYST, NOS, DISTAL		1	(2)	0	(0)	1	(2)	1	(2)	1	(2)	1	(2)
HEMORRHAGE, NOS, DISTAL		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
HEMATOCYST, DISTAL		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
BRAIN	# Ex	50		49		49		50		50		50	
ASTROCYTOMA, CEREBRUM		1	(2)	0	(0)	1	(2)	0	(0)	1	(2)	0	(0)
ASTROCYTOMA, CEREBELLUM		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
COMPRESS. INJURY, BRAIN STEM		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
COMPRESSION INJURY HYPOTHAL.		27	(54)	18	(37)	16	(33)	11	(22)	20	(40)	20	(40)
COMPRESSION INJ. CEREB.PEDUN		0	(0)	1	(2)	2	(4)	0	(0)	0	(0)	0	(0)
HYDROCEPHALUS,INTER.CEREBRUM		15	(30)	15	(31)	14	(29)	6	(12)	13	(26)	15	(30)
HEMORRHAGE, CEREBRUM		1	(2)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
INFLAM. ACT-CHR., CEREBRUM		0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
HEART	# Ex	50		49		49		50		50		50	
VEGETAT. ENDOCARD,CARD.VALVE		0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
THROMBOSIS, NOS, ATRIUM		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
CARDIOMYOPATHY, MYOCARDIUM		26	(52)	9	(18)	19	(39)	13	(26)	24	(48)	18	(36)
INFLAM. ACUTE, MYOCARDIUM		0	(0)	0	(0)	1	(2)	0	(0)	1	(2)	0	(0)
CORON. ART.,ARTERIOSCLEROSIS		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
MINERALIZATION, NOS, MYOCARD		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)

(Report Continued)

Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

PROJECT ID. NO: EDC   FATES: ALL
PAGE 17   DAYS: ALL   SEX: FEMALE

GROUP:		CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:		50		49		49		50		50		50	
		#	%	#	%	#	%	#	%	#	%	#	%
THYROID	# Ex	49		48		48		47		49		47	
FOLLICULAR ADENOMA		0	(0)	0	(0)	1	(2)	0	(0)	1	(2)	2	(4)
C-CELL CARCINOMA		1	(2)	0	(0)	1	(2)	1	(2)	2	(4)	0	(0)
C-CELL ADENOMA, NOS		4	(8)	0	(0)	2	(4)	2	(4)	2	(4)	0	(0)
CYST, FOLLICULAR		0	(0)	3	(6)	0	(0)	1	(2)	1	(2)	0	(0)
CYST, ULTIMOBRANCHIAL		0	(0)	1	(2)	0	(0)	1	(2)	0	(0)	0	(0)
HYPERPLASIA, C-CELL		20	(41)	10	(21)	13	(27)	10	(21)	13	(27)	11	(23)
PARATHYROID	# Ex	41		33		40		36		33		33	
ADENOMA, NOS		0	(0)	2	(6)	0	(0)	1	(3)	0	(0)	1	(3)
HYPERPLASIA		1	(2)	3	(9)	1	(3)	2	(6)	1	(3)	0	(0)
TRACHEA	# Ex	50		49		49		50		50		50	
ESOPHAGUS	# Ex	50		49		49		50		50		50	
INFLAMMATION, CHRONIC		1	(2)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
SPLEEN	# Ex	50		49		49		50		50		50	
HEMATOPOIETIC CELL PROLIFER.		7	(14)	1	(2)	5	(10)	18	(36)	4	(8)	5	(10)
PIGMENT		20	(40)	22	(45)	13	(27)	14	(28)	15	(30)	11	(22)
INFARCT, NOS		0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
ABSCESS, NOS		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
CYST, CAPSULE		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
FIBROSIS, CAPSULE		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	1	(2)
ATROPHY, FOLLICLE		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)

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Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

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PROJECT ID. NO: EDC — FATES: ALL
PAGE 18 — DAYS: ALL — SEX: FEMALE

GROUP:		CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:		50		49		49		50		50		50	
		#	%	#	%	#	%	#	%	#	%	#	%
LIVER	# Ex	50		49		49		50		50		50	
HEPATOCELLULAR CARCINOMA		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
NEOPLASTIC NODULE		1	(2)	1	(2)	0	(0)	2	(4)	1	(2)	1	(2)
FATTY METAMORPHOSIS		11	(22)	2	(4)	18	(37)	0	(0)	8	(16)	13	(26)
FOCAL CELLULAR CHANGE		22	(44)	36	(73)	27	(55)	38	(76)	30	(60)	32	(64)
INFLAMMATION, SUBACUTE		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
INFLAMMATION, CHRONIC		1	(2)	3	(6)	1	(2)	0	(0)	0	(0)	0	(0)
DEGENERATION, LIPOID		1	(2)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
DEGENERATION, CYSTIC		1	(2)	0	(0)	2	(4)	0	(0)	2	(4)	0	(0)
HEMATOPOIETIC CELL PROLIFER.		4	(8)	1	(2)	3	(6)	13	(26)	4	(8)	4	(8)
NECROSIS, ACUTE		6	(12)	0	(0)	0	(0)	1	(2)	0	(0)	2	(4)
NECROSIS, CENTRILOBULAR		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	1	(2)
PIGMENT		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
HISTIOCYTOSIS		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
ABNORMAL CURVATURE, NOS		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
HYPERPLASIA, NEUTROPHILIC		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
ECTASIA, SINUSOID		5	(10)	8	(16)	8	(16)	6	(12)	6	(12)	6	(12)
INTRAHEPATIC BILE DUCT	# Ex	50		49		49		50		50		50	
CHOLANGIOMA		0	(0)	0	(0)	0	(0)	17	(34)	0	(0)	0	(0)
HYPERPLASIA		22	(44)	28	(57)	20	(41)	33	(66)	28	(56)	15	(30)
CYST, NOS		0	(0)	0	(0)	0	(0)	24	(48)	0	(0)	1	(2)

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Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

PROJECT ID. NO: EDC
PAGE 19

FATES: ALL
DAYS: ALL
SEX: FEMALE

GROUP:		CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:		50		49		49		50		50		50	
		#	%	#	%	#	%	#	%	#	%	#	%
LUNG	# Ex	50		49		49		50		50		50	
PNEUMONIA, CHR. INTERSTITIAL		7	(14)	16	(33)	6	(12)	11	(22)	5	(10)	6	(12)
HYPERPL. ALVEOLAR EPITHELIUM		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
HYPERPLASIA, LYMPHOID		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	2	(4)
HISTIOCYTOSIS		6	(12)	5	(10)	3	(6)	7	(14)	3	(6)	4	(8)
FOREIGN BODY REACTION		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
INFLAM., ACUTE, NOS		0	(0)	1	(2)	0	(0)	1	(2)	0	(0)	0	(0)
EDEMA, NOS		0	(0)	0	(0)	0	(0)	1	(2)	1	(2)	0	(0)
PANCREAS	# Ex	50		49		49		49		50		49	
ADENOMA, ISLET, NOS		2	(4)	1	(2)	1	(2)	0	(0)	0	(0)	2	(4)
CARCINOMA, ISLET, NOS		2	(4)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
ATROPHY		7	(14)	6	(12)	6	(12)	5	(10)	8	(16)	2	(4)
FIBROSIS		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
INFLAM., GRANULOMATOUS		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
HYPERPLASIA, ISLET		2	(4)	0	(0)	1	(2)	0	(0)	1	(2)	0	(0)
FOCAL CELLULAR CHANGE		0	(0)	0	(0)	0	(0)	2	(4)	4	(8)	1	(2)
PERIARTERITIS, ARTERY		1	(2)	0	(0)	0	(0)	1	(2)	1	(2)	1	(2)
HYPERPL., INTRALOBULAR DUCT		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
HYPERPLASIA		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
METAPLASIA, HEPATOCYTIC		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
SALIVARY GLAND	# Ex	50		49		49		49		50		49	
CARCINOSARCOMA		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
ATROPHY		1	(2)	1	(2)	1	(2)	0	(0)	1	(2)	0	(0)
INFLAM., ACUTE		0	(0)	0	(0)	0	(0)	1	(2)	1	(2)	0	(0)
HYPERPLASIA, DUCT		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)

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Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

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PROJECT ID. NO: EDC   FATES: ALL
PAGE 20   DAYS: ALL   SEX: FEMALE

GROUP:	CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:	50		49		49		50		50		50	
	#	%	#	%	#	%	#	%	#	%	#	%
MANDIBULAR LYMPH NODE	# Ex 48		48		45		47		50		48	
PLASMA CELL TUMOR	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
HYPERPLASIA, LYMPHOID	1	(2)	0	(0)	0	(0)	2	(4)	0	(0)	0	(0)
HYPERPLASIA, PLASMA CELL	11	(23)	6	(13)	9	(20)	16	(34)	12	(24)	7	(15)
CONGESTION	2	(4)	2	(4)	2	(4)	4	(9)	2	(4)	3	(6)
DEGENERATION, CYSTIC	3	(6)	1	(2)	2	(4)	2	(4)	1	(2)	0	(0)
HEMORRHAGE	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
HISTIOCYTOSIS	0	(0)	1	(2)	0	(0)	1	(2)	1	(2)	0	(0)
PIGMENT	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
THYMUS	# Ex 44		47		46		40		45		44	
THYMOMA, MEDULLA	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	1	(2)
CYST, NOS	0	(0)	3	(6)	0	(0)	1	(3)	1	(2)	0	(0)
HYPERPLASIA, MEDULLA	0	(0)	1	(2)	0	(0)	5	(13)	0	(0)	0	(0)

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Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

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PROJECT ID. NO: EDC FATES: ALL
PAGE 21 DAYS: ALL SEX: FEMALE

GROUP:		CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:		50		49		49		50		50		50	
		#	%	#	%	#	%	#	%	#	%	#	%
KIDNEY	# Ex	50		49		49		50		50		50	
NEPHROPATHY, CHRONIC		26	(52)	8	(16)	28	(57)	14	(28)	28	(56)	23	(46)
ATROPHY		2	(4)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
CYST, NOS		1	(2)	0	(0)	0	(0)	1	(2)	2	(4)	1	(2)
LIPOMATOSIS		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
INFLAM., ACUTE		0	(0)	0	(0)	2	(4)	0	(0)	0	(0)	0	(0)
INFLAM., ACT-CHR. PELVIS		1	(2)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
INFLAM., ACUTE, PELVIS		5	(10)	2	(4)	3	(6)	1	(2)	2	(4)	0	(0)
INFLAM.,CHR., PELVIS		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
INFLAM.,CHR., PAPILLA		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
CALCULUS, PELVIS		27	(54)	7	(14)	12	(24)	12	(24)	29	(58)	13	(26)
HYDRONEPHROSIS, PELVIS		5	(10)	4	(8)	5	(10)	9	(18)	6	(12)	6	(12)
EPITHELIAL HYPERPL.,PELVIS		16	(32)	3	(6)	11	(22)	7	(14)	14	(28)	8	(16)
PAPILLARY NECROSIS		0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
LIPOID DEGENERATION, TUBULE		0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
INFARCT, NOS		1	(2)	0	(0)	1	(2)	0	(0)	0	(0)	1	(2)
ADRENAL GLAND	# Ex	50		47		49		47		50		42	
ADENOMA, NOS, CORTEX		2	(4)	1	(2)	1	(2)	0	(0)	2	(4)	2	(5)
PHEOCHROMOCYTOMA, MEDULLA		1	(2)	1	(2)	2	(4)	1	(2)	0	(0)	2	(5)
ACCESSORY ADRENAL CORTEX		0	(0)	2	(4)	0	(0)	0	(0)	2	(4)	0	(0)
HEMATOPOIETIC CELL PROLIFER.		2	(4)	0	(0)	1	(2)	4	(9)	0	(0)	2	(5)
DEVELOPMENTAL MALFORMATION		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
ATROPHY		0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
LIPOID DEGENERATION, CORTEX		1	(2)	3	(6)	2	(4)	3	(6)	5	(10)	1	(2)
HYPERTROPHY, CORTEX		7	(14)	5	(11)	10	(20)	12	(26)	13	(26)	10	(24)
HYPERPLASIA, CORTEX		12	(24)	2	(4)	6	(12)	4	(9)	9	(18)	6	(14)
HEMATOCYST, CORTEX		41	(82)	36	(77)	35	(71)	40	(85)	43	(86)	38	(90)
INFARCT, CORTEX		0	(0)	1	(2)	1	(2)	0	(0)	0	(0)	0	(0)
HISTIOCYTOSIS		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
HYPERPLASIA, MEDULLA		2	(4)	0	(0)	3	(6)	2	(4)	4	(8)	6	(14)
INFLAM. CHRONIC, CAPSULE		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)

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WORK ASSIGNMENT EDC
SPRAGUE-DAWLEY RATS
MRI/NIOSH

Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

PROJECT ID. NO: EDC
PAGE 22

FATES: ALL
DAYS: ALL
SEX: FEMALE

GROUP:	CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:	50		49		49		50		50		50	
	#	%	#	%	#	%	#	%	#	%	#	%
MAMMARY GLAND	# Ex 50		46		45		48		50		47	
ADENOCARCINOMA	4	(8)	2	(4)	6	(13)	12	(25)	5	(10)	2	(4)
ADENOMA, NOS	2	(4)	2	(4)	2	(4)	3	(6)	4	(8)	4	(9)
FIBROADENOMA	15	(30)	5	(11)	12	(27)	19	(40)	21	(42)	15	(32)
HEMATOMA, NOS	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
RETENTION OF CONTENT	24	(48)	25	(54)	26	(58)	19	(40)	29	(58)	23	(49)
INFLAM., CHRONIC	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
FIBROSIS	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	2	(4)
HYPERPLASIA	2	(4)	2	(4)	2	(4)	0	(0)	3	(6)	1	(2)
ABSCESS, NOS	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	2	(4)
URINARY BLADDER	# Ex 49		48		49		49		50		50	
TRANSITIONAL PAPILLOMA	1	(2)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
INFLAM., CHRONIC	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
INFLAM., ACUTE	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
INFLAM., SUBACUTE	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
FORESTOMACH	# Ex 50		49		49		49		50		50	
INFLAM., ACUTE	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
INFLAM., CHRONIC	0	(0)	0	(0)	1	(2)	1	(2)	0	(0)	1	(2)
HYPERPLASIA, EPITHELIAL	2	(4)	0	(0)	2	(4)	2	(4)	0	(0)	2	(4)
ULCER, NOS	1	(2)	0	(0)	1	(2)	0	(0)	0	(0)	1	(2)
GLANDULAR STOMACH	# Ex 50		49		49		49		50		50	
DEGENERATION	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
SMALL INTESTINE	# Ex 50		49		49		49		50		49	
ADENOMATOUS POLYP	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
INFLAM., HEMORRHAGIC	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
COLON	# Ex 50		49		49		50		50		50	
PARASITISM,NOS	2	(4)	2	(4)	4	(8)	6	(12)	2	(4)	2	(4)
INFLAM., SUBACUTE	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
INFLAM. CHRONIC	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)

WORK ASSIGNMENT EDC
SPRAGUE-DAWLEY RATS
MRI/NIOSH

Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

PROJECT ID. NO: EDC
PAGE 23
FATES: ALL
DAYS: ALL
SEX: FEMALE

GROUP:		CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:		50		49		49		50		50		50	
		#	%	#	%	#	%	#	%	#	%	#	%
MESENTERIC LYMPH NODE	# Ex	50		49		48		49		50		48	
HYPERPLASIA, LYMPHOID		3	(6)	3	(6)	1	(2)	2	(4)	1	(2)	2	(4)
CONGESTION		0	(0)	35	(71)	1	(2)	30	(61)	1	(2)	1	(2)
PIGMENT		1	(2)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
HEMORRHAGE		0	(0)	0	(0)	0	(0)	2	(4)	0	(0)	0	(0)
INFLAM., GRANULOMATOUS		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
HISTIOCYTOSIS		1	(2)	1	(2)	2	(4)	0	(0)	2	(4)	0	(0)
DEGENERATION, CYSTIC		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
ADENOCARCINOMA		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
OVARY	# Ex	48		47		49		47		48		41	
SARCOMA, NOS		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
STROMAL TUMOR		0	(0)	1	(2)	0	(0)	1	(2)	0	(0)	0	(0)
GRANULOSA THECA CELL TUMOR		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
ABSCESS, NOS		0	(0)	0	(0)	0	(0)	2	(4)	0	(0)	0	(0)
ATROPHY		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
CYST, NOS		7	(15)	6	(13)	10	(20)	11	(23)	10	(21)	3	(7)
HYPERPLASIA, STROMAL		4	(8)	4	(9)	3	(6)	10	(21)	5	(10)	11	(27)
UTERUS	# Ex	49		49		49		50		49		50	
STROMAL SARCOMA, ENDOMETRIUM		1	(2)	0	(0)	0	(0)	1	(2)	0	(0)	1	(2)
ADENOMA, NOS, ENDOMETRIUM		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
SARCOMA, NOS, CERVIX		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
LEIOMYOMA		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
STROMAL POLYP, ENDOMETRIUM		2	(4)	5	(10)	3	(6)	5	(10)	3	(6)	2	(4)
DILATATION		3	(6)	0	(0)	4	(8)	4	(8)	3	(6)	4	(8)
INTUSSUSCEPTION		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
INFLAMMATION, ACT-CHR.		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
INFLAMMATION, CHRONIC		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
INFLAM. ACUTE, ENDOMETRIUM		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
ABSCESS, NOS		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
CYST, NOS, ENDOMETRIUM		7	(14)	1	(2)	6	(12)	3	(6)	1	(2)	1	(2)
HYPERPL. CYSTIC, ENDOMETRIUM		0	(0)	0	(0)	1	(2)	1	(2)	0	(0)	0	(0)
HYPERPLASIA STROMAL, CERVIX		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
ADENOCARCINOMA		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
INFLAM., CHR., ENDOMETRIUM		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
HYPERPLASIA, ENDOMETRIUM		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)

WORK ASSIGNMENT EDC
SPRAGUE-DAWLEY RATS
MRI/NIOSH

Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

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PROJECT ID. NO: EDC
PAGE 24

FATES: ALL
DAYS: ALL
SEX: FEMALE

GROUP:		CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:		50		49		49		50		50		50	
		#	%	#	%	#	%	#	%	#	%	#	%
TESTES	# Ex	0		0		0		0		0		0	
PROSTATE	# Ex	0		0		0		0		0		0	
BONE/MARROW	# Ex	50		49		49		49		50		50	
OSTEOGENIC SARCOMA		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
OSTEOMALACIA		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
HYPEROSTOSIS		0	(0)	0	(0)	1	(2)	0	(0)	1	(2)	0	(0)
EXOSTOSIS		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
HYPERPLASIA, MARROW		5	(10)	1	(2)	4	(8)	20	(41)	2	(4)	2	(4)
ATROPHY, MARROW		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
NASAL CAVITY/MUCOUS MEMBRANE	# Ex	50		49		49		50		50		50	
SQUAMOUS CELL CARCINOMA		0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
SQUAMOUS METAPLASIA		0	(0)	0	(0)	1	(2)	1	(2)	1	(2)	1	(2)
METAPLASIA, NOS		0	(0)	0	(0)	2	(4)	0	(0)	0	(0)	0	(0)
INFLAM., ACUTE		4	(8)	4	(8)	4	(8)	3	(6)	3	(6)	2	(4)
INFLAM., ACT-CHR.		3	(6)	0	(0)	5	(10)	3	(6)	5	(10)	3	(6)
INFLAM., CHRONIC		0	(0)	1	(2)	0	(0)	0	(0)	1	(2)	0	(0)
INFLAM., SUBACUTE		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
FOREIGN BODY, NOS		1	(2)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
MEDIASTINAL LYMPH NODE	# Ex	2		2		2		5		3		4	
DEGENERATION, CYSTIC		0	(0)	0	(0)	1	(50)	0	(0)	1	(33)	2	(50)
HEMORRHAGE		0	(0)	0	(0)	0	(0)	0	(0)	1	(33)	0	(0)
CONGESTION		0	(0)	2	(100)	1	(50)	3	(60)	1	(33)	2	(50)
PIGMENT		1	(50)	0	(0)	0	(0)	1	(20)	0	(0)	0	(0)
HYPERPLASIA, PLASMA CELL		1	(50)	0	(0)	0	(0)	2	(40)	0	(0)	0	(0)
HYPERPLASIA, LYMPHOID		0	(0)	0	(0)	0	(0)	1	(20)	0	(0)	0	(0)
LARYNX	# Ex	50		48		49		49		50		49	
INFLAM., CHRONIC		0	(0)	1	(2)	1	(2)	3	(6)	0	(0)	1	(2)
INFLAM., ACUTE		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
INFLAM., SUBACUTE		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)

Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

PROJECT ID. NO: EDC
PAGE 25

FATES: ALL
DAYS: ALL
SEX: FEMALE

GROUP:		CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:		50		49		49		50		50		50	
		#	%	#	%	#	%	#	%	#	%	#	%
SKIN	# Ex	49		49		49		49		50		50	
SQUAMOUS CELL CARCINOMA		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
BASAL CELL TUMOR		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
CYST, EPITHELIAL		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
ABSCESS, NOS		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
INFLAMMATION, ACUTE		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
INFLAM., SUBACUTE		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
SUBCUTIS	# Ex	49		49		49		49		50		50	
SARCOMA, NOS		0	(0)	0	(0)	0	(0)	1	(2)	1	(2)	0	(0)
FIBROMA, NOS		1	(2)	0	(0)	1	(2)	5	(10)	2	(4)	0	(0)
LIPOMA		0	(0)	0	(0)	2	(4)	0	(0)	0	(0)	1	(2)
ABSCESS, NOS		0	(0)	0	(0)	1	(2)	1	(2)	0	(0)	0	(0)
FOREIGN BODY REACTION		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
EDEMA, NOS		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
NASAL ASSOCIATED STRUCTURES	# Ex	18		25		22		22		10		19	
ABSCESS, NOS, TOOTH		3	(17)	6	(24)	6	(27)	5	(23)	0	(0)	2	(11)
DEFORMITY, TOOTH		9	(50)	12	(48)	15	(68)	15	(68)	9	(90)	11	(58)
INFLAM.ACT-CHR.LACRIMAL DUCT		4	(22)	4	(16)	5	(23)	2	(9)	1	(10)	2	(11)
INFLAM.CHR., LACRIMAL DUCT		8	(44)	13	(52)	6	(27)	9	(41)	1	(10)	5	(26)
INFLAM. ACUTE, LACRIMAL DUCT		1	(6)	0	(0)	1	(5)	1	(5)	0	(0)	1	(5)
SQUAM. METAPL. LACRIMAL DUCT		0	(0)	1	(4)	0	(0)	0	(0)	0	(0)	0	(0)
SEMINAL VESICLE	# Ex	0		0		0		0		0		0	
EYE	# Ex	6		1		0		1		2		0	
HEMANGIOSARCOMA		0	(0)	0	(0)	0		0	(0)	1	(50)	0	
INFLAM., CHR., LACRIMAL GL.		1	(17)	0	(0)	0		0	(0)	0	(0)	0	
INFLAM., ACUTE, CHAMBERS		0	(0)	0	(0)	0		0	(0)	1	(50)	0	
INFLAM., ACUTE, SHEATH		0	(0)	0	(0)	0		0	(0)	1	(50)	0	

(Report Continued)

Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

PROJECT ID. NO: EDC FATES: ALL
PAGE 26 DAYS: ALL SEX: FEMALE

GROUP:		CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:		50		49		49		50		50		50	
		#	%	#	%	#	%	#	%	#	%	#	%
CONJUNCTIVA	# Ex	3		1		4		2		2		0	
INFLAMMATION, ACUTE		0	(0)	0	(0)	0	(0)	1	(50)	0	(0)	0	
ULCER, NOS		0	(0)	0	(0)	0	(0)	0	(0)	1	(50)	0	
INFLAMMATION, SUBACUTE		0	(0)	0	(0)	1	(25)	0	(0)	0	(0)	0	

(Report Continued)

Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

PROJECT ID. NO: EDC FATES: ALL
PAGE 27 DAYS: ALL SEX: FEMALE

GROUP:	CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:	50		49		49		50		50		50	
	#	%	#	%	#	%	#	%	#	%	#	%
OTHER TISSUES AND LESIONS:												
MESENTERIC ART., PERIARTERITIS	0	(0)	1	(2)	0	(0)	1	(2)	0	(0)	2	(4)
MESENTERY, FIBROSARCOMA	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
PERITONEUM HYPERPL.MESOTHELIUM	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
PERITONEUM MESOTHELIOMA	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
PERITONEUM INFLAM.ACT-CHR.	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
FATTY TISSUE, NECROSIS, FAT	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
PREPUT/CLIT GL, ABSCESS,NOS	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
PREPUT/CLIT GL, RETENT.OF CONT	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
VAGINA, INFLAM., ACUTE	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	1	(2)
CECUM, INFLAM., CHRONIC	2	(4)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
PANCREATIC L.N., CONGESTION	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
FOOT, ULCER, NOS	2	(4)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
ZYMBALS GLAND, CARCINOMA, NOS	0	(0)	0	(0)	0	(0)	1	(2)	1	(2)	0	(0)
AURICULAR CART., DEGENERATION	0	(0)	1	(2)	0	(0)	0	(0)	1	(2)	0	(0)
JOINT, INFLAM., CHRONIC	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
HARD PALATE, INFLAM., CHRONIC	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
VAGINA,STROMAL POLYP	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
MESENTERY, SARCOMA	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)

(End of Report)

Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

PROJECT ID. NO: EDC FATES:-ALL
PAGE 18 DAYS: ALL SEX: MALE

GROUP:		CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:		50		50		50		50		50		50	
		#	%	#	%	#	%	#	%	#	%	#	%
PITUITARY	# Ex	48		49		48		48		49		44	
CARCINOMA, NOS, DISTAL		1	(2)	0	(0)	1	(2)	1	(2)	1	(2)	1	(2)
ADENOMA, NOS, DISTAL		30	(63)	23	(47)	30	(63)	17	(35)	30	(61)	22	(50)
HYPERPLASIA, NOS, DISTAL		9	(19)	9	(18)	5	(10)	8	(17)	12	(24)	9	(20)
CYST, NOS, DISTAL		1	(2)	0	(0)	2	(4)	1	(2)	2	(4)	3	(7)
HEMORRHAGE, NOS, DISTAL		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
HEMATOCYST, DISTAL		0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
MALFORMATION, NOS, STALK		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
DEGENERATION, INTERMEDIA		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
INFLAM., ACUTE		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
BRAIN	# Ex	50		50		50		50		50		50	
ASTROCYTOMA, CEREBRUM		0	(0)	0	(0)	2	(4)	0	(0)	0	(0)	1	(2)
ASTROCYTOMA, BRAIN STEM		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
EPENDYMOMA		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
COMPRESSION INJURY HYPOTHAL.		12	(24)	8	(16)	7	(14)	5	(10)	9	(18)	9	(18)
HYDROCEPHALUS,INTER.CEREBRUM		9	(18)	7	(14)	7	(14)	5	(10)	8	(16)	6	(12)
MINERALIZATION, CEREBRUM		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
GLIOSIS, CEREBRUM		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
INFLAM. SUBACUTE,CEREB.MENIN		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
HEMATOMA, NOS, DURA		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
HEART	# Ex	50		50		50		50		50		50	
ADENOCARCINOMA		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
THROMBOSIS, NOS, ATRIUM		0	(0)	0	(0)	3	(6)	1	(2)	0	(0)	0	(0)
CARDIOMYOPATHY, MYOCARDIUM		35	(70)	31	(62)	33	(66)	30	(60)	41	(82)	33	(66)
INFLAM. ACUTE, EPICARDIUM		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
INFLAM. ACUTE, MYOCARDIUM		0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
PERIARTERITIS,CORON. ARTERY		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
SACROMA, NOS ENDOCARDIUM		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)

(Report Continued)

Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

PROJECT ID. NO: EDC FATES: ALL
PAGE 19 DAYS: ALL SEX: MALE

GROUP:		CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:		50		50		50		50		50		50	
		#	%	#	%	#	%	#	%	#	%	#	%
THYROID	# Ex	48		50		50		50		48		47	
FOLLICULAR CARCINOMA		0	(0)	2	(4)	1	(2)	1	(2)	0	(0)	1	(2)
FOLLICULAR ADENOMA		4	(8)	1	(2)	1	(2)	4	(8)	3	(6)	1	(2)
C-CELL CARCINOMA		0	(0)	0	(0)	1	(2)	2	(4)	0	(0)	2	(4)
C-CELL ADENOMA, NOS		6	(13)	4	(8)	8	(16)	5	(10)	5	(10)	2	(4)
CYST, FOLLICULAR		1	(2)	1	(2)	1	(2)	5	(10)	0	(0)	1	(2)
HYPERPLASIA, FOLLICULAR CELL		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
HYPERPLASIA, C-CELL		12	(25)	13	(26)	9	(18)	13	(26)	11	(23)	7	(15)
INFLAMMATION, CHRONIC		1	(2)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
PERIARTERITIS, ARTERY		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
PARATHYROID	# Ex	41		38		43		41		34		35	
ADENOMA, NOS		2	(5)	0	(0)	1	(2)	3	(7)	0	(0)	1	(3)
HYPERPLASIA		3	(7)	1	(3)	5	(12)	3	(7)	7	(21)	2	(6)
TRACHEA	# Ex	50		50		50		50		50		50	
ESOPHAGUS	# Ex	50		50		50		50		50		49	
SPLEEN	# Ex	50		50		50		50		50		50	
HEMATOPOIETIC CELL PROLIFER.		1	(2)	0	(0)	4	(8)	5	(10)	2	(4)	5	(10)
PIGMENT		3	(6)	3	(6)	0	(0)	3	(6)	1	(2)	1	(2)
HEMATOCYST		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
INFARCT, NOS		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
CYST, CAPSULE		0	(0)	1	(2)	1	(2)	0	(0)	0	(0)	1	(2)
FIBROSIS, CAPSULE		2	(4)	2	(4)	1	(2)	1	(2)	2	(4)	0	(0)
ATROPHY, FOLLICLE		0	(0)	0	(0)	0	(0)	0	(0)	2	(4)	1	(2)
HYPERPLASIA, FOLLICLE		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)

(Report Continued)

Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

PROJECT ID. NO: EDC FATES: ALL
PAGE 20 DAYS: ALL SEX: MALE

GROUP:		CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:		50		50		50		50		50		50	
		#	%	#	%	#	%	#	%	#	%	#	%
LIVER	# Ex	50		50		50		49		50		50	
HEPATOCELLULAR CARCINOMA		1	(2)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
NEOPLASTIC NODULE		0	(0)	1	(2)	2	(4)	6	(12)	2	(4)	4	(8)
HEMORRHAGE		0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	1	(2)
GRANULOMA		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
FATTY METAMORPHOSIS		10	(20)	2	(4)	9	(18)	3	(6)	10	(20)	9	(18)
FOCAL CELLULAR CHANGE		17	(34)	34	(68)	21	(42)	32	(65)	25	(50)	27	(54)
INFLAMMATION, ACUTE		1	(2)	0	(0)	1	(2)	0	(0)	1	(2)	0	(0)
INFLAMMATION, SUBACUTE		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
INFLAMMATION, CHRONIC		1	(2)	1	(2)	1	(2)	0	(0)	2	(4)	0	(0)
DEGENERATION, CENTRILOBULAR		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
DEGENERATION, LIPOID		1	(2)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
DEGENERATION, CYSTIC		8	(16)	1	(2)	13	(26)	8	(16)	6	(12)	16	(32)
CYST, NOS		0	(0)	0	(0)	0	(0)	2	(4)	0	(0)	0	(0)
HEMATOPOIETIC CELL PROLIFER.		1	(2)	0	(0)	3	(6)	3	(6)	1	(2)	2	(4)
NECROSIS, ACUTE		1	(2)	1	(2)	1	(2)	0	(0)	2	(4)	2	(4)
NECROSIS, CENTRILOBULAR		0	(0)	0	(0)	1	(2)	1	(2)	0	(0)	0	(0)
ABNORMAL CURVATURE, NOS		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
ECTASIA, SINUSOID		1	(2)	1	(2)	4	(8)	4	(8)	4	(8)	4	(8)
CONGESTION, CHRONIC		1	(2)	0	(0)	1	(2)	1	(2)	0	(0)	0	(0)
PERIARTERITIS, ARTERY		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
INTRAHEPATIC BILE DUCT	# Ex	50		50		50		50		50		50	
CHOLANGIOMA		0	(0)	0	(0)	0	(0)	9	(18)	0	(0)	0	(0)
HYPERPLASIA		31	(62)	34	(68)	24	(48)	43	(86)	31	(62)	25	(50)
CYST, NOS		1	(2)	0	(0)	2	(4)	12	(24)	0	(0)	0	(0)

(Report Continued)

Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

PROJECT ID. NO: EDC FATES: ALL
PAGE 21 DAYS: ALL SEX: MALE

GROUP:		CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:		50		50		50		50		50		50	
		#	%	#	%	#	%	#	%	#	%	#	%
LUNG	# Ex	50		50		50		50		50		49	
ADENOCARCINOMA		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
PNEUMONIA, ASPIRATION		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
PNEUMONIA, CHR. INTERSTITIAL		5	(10)	17	(34)	5	(10)	13	(26)	10	(20)	5	(10)
HYPERPL. ALVEOLAR EPITHELIUM		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
HYPERPLASIA, LYMPHOID		1	(2)	0	(0)	1	(2)	2	(4)	1	(2)	0	(0)
HISTIOCYTOSIS		9	(18)	4	(8)	2	(4)	5	(10)	4	(8)	3	(6)
FOREIGN BODY REACTION		1	(2)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
INFLAM., CHR., NOS		0	(0)	1	(2)	1	(2)	0	(0)	0	(0)	0	(0)
INFLAM., ACUTE, NOS		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
INFLAM., GRANULOMATOUS		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
PIGMENT		0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	1	(2)
CALCIFICATION, PULMON.ARTERY		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
HEMORRHAGE		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	1	(2)
CONGESTION		1	(2)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
ABSCESS, NOS		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
PANCREAS	# Ex	50		50		49		50		50		49	
ADENOMA, ISLET, NOS		3	(6)	0	(0)	4	(8)	0	(0)	3	(6)	2	(4)
CARCINOMA, ISLET, NOS		0	(0)	1	(2)	3	(6)	1	(2)	1	(2)	0	(0)
ATROPHY		7	(14)	9	(18)	9	(18)	7	(14)	7	(14)	13	(27)
INFLAM., ACTIVE-CHRONIC		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
INFLAM., NECROTIZING		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
HYPERPLASIA, ISLET		1	(2)	4	(8)	1	(2)	0	(0)	0	(0)	1	(2)
FOCAL CELLULAR CHANGE		2	(4)	1	(2)	1	(2)	5	(10)	0	(0)	3	(6)
PERIARTERITIS, ARTERY		2	(4)	1	(2)	2	(4)	1	(2)	4	(8)	0	(0)
HYPERPL., INTRALOBULAR DUCT		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
HYPERPLASIA		0	(0)	0	(0)	0	(0)	2	(4)	0	(0)	1	(2)
ARTERIOSCLEROSIS		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
INFLAMMATION, ACUTE		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)

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Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

PROJECT ID. NO: EDC FATES: ALL
PAGE 22 DAYS: ALL SEX: MALE

GROUP:		CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:		50		50		50		50		50		50	
		#	%	#	%	#	%	#	%	#	%	#	%
SALIVARY GLAND	# Ex	49		50		50		50		50		50	
NEUROFIBROSARCOMA		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
ATROPHY		1	(2)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
INFLAM., SUBACUTE		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
SQUAMOUS METAPLASIA		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
MANDIBULAR LYMPH NODE	# Ex	49		45		48		48		50		47	
HYPERPLASIA, LYMPHOID		1	(2)	2	(4)	0	(0)	1	(2)	1	(2)	0	(0)
HYPERPLASIA, PLASMA CELL		16	(33)	12	(27)	15	(31)	11	(23)	13	(26)	15	(32)
CONGESTION		1	(2)	2	(4)	2	(4)	2	(4)	3	(6)	1	(2)
DEGENERATION, CYSTIC		2	(4)	4	(9)	3	(6)	1	(2)	2	(4)	1	(2)
HISTIOCYTOSIS		0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
PIGMENT		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
THYMUS	# Ex	40		40		44		45		40		41	
THYMOMA, MEDULLA		0	(0)	1	(3)	0	(0)	0	(0)	0	(0)	0	(0)
CYST, NOS		0	(0)	1	(3)	1	(2)	0	(0)	0	(0)	0	(0)
HEMORRHAGE		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
HYPERPLASIA, MEDULLA		0	(0)	0	(0)	0	(0)	0	(0)	1	(3)	0	(0)

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Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

PROJECT ID. NO: EDC
PAGE 23

FATES: ALL
DAYS: ALL
SEX: MALE

GROUP:		CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:		50		50		50		50		50		50	
		#	%	#	%	#	%	#	%	#	%	#	%
KIDNEY	# Ex	50		50		50		50		50		50	
LIPOSARCOMA		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
TRANSITIONAL PAPILLOMA		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
NEPHROPATHY, CHRONIC		40	(80)	37	(74)	41	(82)	42	(84)	37	(74)	38	(76)
CYST, NOS		2	(4)	1	(2)	1	(2)	2	(4)	3	(6)	2	(4)
INFLAM., ACUTE		1	(2)	0	(0)	2	(4)	0	(0)	0	(0)	1	(2)
INFLAM., ACT-CHR. PELVIS		1	(2)	2	(4)	0	(0)	0	(0)	1	(2)	1	(2)
INFLAM., ACUTE, PELVIS		2	(4)	0	(0)	3	(6)	2	(4)	1	(2)	2	(4)
INFLAM., SUBACUTE		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
INFLAM., SUBACUTE, PELVIS		0	(0)	1	(2)	0	(0)	0	(0)	1	(2)	0	(0)
MINERALIZATION, PELVIS		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	1	(2)
CALCULUS, PELVIS		5	(10)	1	(2)	0	(0)	3	(6)	4	(8)	0	(0)
HYDRONEPHROSIS, PELVIS		1	(2)	1	(2)	0	(0)	0	(0)	6	(12)	5	(10)
EPITHELIAL HYPERPL.,PELVIS		3	(6)	1	(2)	2	(4)	1	(2)	6	(12)	1	(2)
PAPILLARY NECROSIS		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	1	(2)
ARTERY, PERIARTERITIS		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
ABSCESS, NOS		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
THROMBOSIS, NOS, RENAL VEIN		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
ADRENAL GLAND	# Ex	48		49		49		50		50		46	
ADENOMA, NOS, CORTEX		3	(6)	1	(2)	1	(2)	1	(2)	1	(2)	1	(2)
PHEOCHROMOCYTOMA, MEDULLA		11	(23)	4	(8)	18	(37)	9	(18)	19	(38)	10	(22)
ACCESSORY ADRENAL CORTEX		2	(4)	4	(8)	0	(0)	8	(16)	4	(8)	1	(2)
ATROPHY		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
LIPOID DEGENERATION, CORTEX		2	(4)	2	(4)	6	(12)	9	(18)	11	(22)	4	(9)
HYPERTROPHY, CORTEX		1	(2)	9	(18)	3	(6)	8	(16)	3	(6)	6	(13)
HYPERPLASIA, CORTEX		9	(19)	3	(6)	4	(8)	6	(12)	8	(16)	3	(7)
HEMATOCYST, CORTEX		7	(15)	4	(8)	4	(8)	7	(14)	5	(10)	7	(15)
FIBROSIS, CORTEX		0	(0)	0	(0)	0	(0)	2	(4)	0	(0)	0	(0)
INFARCT, CORTEX		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
HYPERPLASIA, MEDULLA		9	(19)	5	(10)	7	(14)	4	(8)	11	(22)	15	(33)
HYPERTROPHY, MEDULLA		0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)

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Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

PROJECT ID. NO: EDC
PAGE 24

FATES: ALL
DAYS: ALL SEX: MALE

GROUP:		CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:		50		50		50		50		50		50	
		#	%	#	%	#	%	#	%	#	%	#	%
MAMMARY GLAND	# Ex	44		43		43		38		40		41	
ADENOCARCINOMA		0	(0)	0	(0)	0	(0)	1	(3)	0	(0)	0	(0)
ADENOMA, NOS		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	1	(2)
FIBROADENOMA		0	(0)	0	(0)	0	(0)	0	(0)	1	(3)	1	(2)
RETENTION OF CONTENT		10	(23)	0	(0)	8	(19)	1	(3)	12	(30)	4	(10)
INFLAM., CHRONIC		0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
ABSCESS, NOS		0	(0)	0	(0)	0	(0)	0	(0)	1	(3)	1	(2)
URINARY BLADDER	# Ex	50		49		50		50		50		50	
TRANSITIONAL PAPILLOMA		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
INFLAM., CHRONIC		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
INFLAM., ACUTE		1	(2)	0	(0)	1	(2)	0	(0)	0	(0)	1	(2)
INFLAM., SUBACUTE		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
INFLAM., ACT-CHR.		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	1	(2)
FORESTOMACH	# Ex	48		50		50		49		50		50	
INFLAM., ACT-CHR.		1	(2)	1	(2)	1	(2)	0	(0)	0	(0)	0	(0)
INFLAM., CHRONIC		2	(4)	0	(0)	1	(2)	0	(0)	1	(2)	0	(0)
HYPERPLASIA, EPITHELIAL		3	(6)	1	(2)	1	(2)	1	(2)	2	(4)	0	(0)
EROSION, NOS		2	(4)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
ULCER, NOS		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
GLANDULAR STOMACH	# Ex	50		50		50		50		50		50	
EROSION, NOS		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
DEGENERATION		0	(0)	0	(0)	1	(2)	0	(0)	3	(6)	1	(2)
SMALL INTESTINE	# Ex	49		50		50		50		50		48	
ADENOCARCINOMA, ILEUM		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
ADENOCARCINOMA, JEJUNUM		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
HYPERPL., LYMPHOID, ILEUM		0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
ULCER, JEJUNUM		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
CYST, NOS, ILEUM		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
DIVERTICULUM, DUODENUM		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)

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Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

PROJECT ID. NO: EDC
PAGE 25

FATES: ALL
DAYS: ALL
SEX: MALE

GROUP:		CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:		50		50		50		50		50		50	
		#	%	#	%	#	%	#	%	#	%	#	%
COLON	# Ex	49		50		49		47		48		47	
PARASITISM,NOS		2	(4)	3	(6)	2	(4)	0	(0)	3	(6)	3	(6)
HYPERPLASIA, LYMPHOID		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
MESENTERIC LYMPH NODE	# Ex	45		50		47		49		50		49	
HEMANGIOMA		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
HEMANGIOSARCOMA		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
ATROPHY		0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
FIBROSIS		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
HYPERPLASIA, LYMPHOID		3	(7)	2	(4)	2	(4)	4	(8)	2	(4)	4	(8)
CONGESTION		2	(4)	32	(64)	1	(2)	24	(49)	3	(6)	1	(2)
PIGMENT		0	(0)	3	(6)	0	(0)	1	(2)	0	(0)	0	(0)
HEMORRHAGE		0	(0)	1	(2)	1	(2)	3	(6)	0	(0)	1	(2)
INFLAM., CHRONIC		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
HISTIOCYTOSIS		1	(2)	0	(0)	1	(2)	3	(6)	0	(0)	0	(0)
DEGENERATION, CYSTIC		2	(4)	0	(0)	0	(0)	0	(0)	2	(4)	0	(0)
OVARY	# Ex	0		0		0		0		0		0	
UTERUS	# Ex	0		0		0		0		0		0	
TESTES	# Ex	50		50		50		50		50		50	
INTERSTITIAL CELL TUMOR		2	(4)	3	(6)	7	(14)	11	(22)	3	(6)	5	(10)
MESOTHELIOMA		0	(0)	0	(0)	0	(0)	2	(4)	0	(0)	0	(0)
HYPERPL., INTERSTITIAL CELL		1	(2)	0	(0)	2	(4)	1	(2)	0	(0)	0	(0)
ATROPHY		9	(18)	5	(10)	8	(16)	8	(16)	14	(28)	11	(22)
ARTERY, PERIARTERITIS		1	(2)	0	(0)	0	(0)	3	(6)	4	(8)	3	(6)

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Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

PROJECT ID. NO: EDC FATES: ALL
PAGE 26 DAYS: ALL SEX: MALE

GROUP:		CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:		50		50		50		50		50		50	
		#	%	#	%	#	%	#	%	#	%	#	%
PROSTATE	# Ex	50		49		46		50		50		50	
HYPERPLASIA		4	(8)	1	(2)	8	(17)	6	(12)	5	(10)	3	(6)
INFLAM., ACUTE		3	(6)	5	(10)	3	(7)	4	(8)	0	(0)	7	(14)
INFLAM., ACT-CHR.		3	(6)	4	(8)	1	(2)	2	(4)	4	(8)	4	(8)
INFLAM., CHRONIC		1	(2)	2	(4)	1	(2)	1	(2)	0	(0)	1	(2)
INFLAM., SUBACUTE		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
RETENTION OF CONTENT		2	(4)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
BONE/MARROW	# Ex	50		50		50		50		50		50	
MESENCHYMOMA, VERTEBRAE		0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
OSTEOGENIC SARCOMA		0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	1	(2)
OSTEOMALACIA		0	(0)	0	(0)	2	(4)	0	(0)	4	(8)	1	(2)
HYPEROSTOSIS		1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	2	(4)
EXOSTOSIS		0	(0)	0	(0)	1	(2)	3	(6)	0	(0)	1	(2)
OSTEOMYELITIS		0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
HYPERPLASIA, MARROW		5	(10)	0	(0)	3	(6)	10	(20)	8	(16)	7	(14)
ATROPHY, MARROW		1	(2)	0	(0)	1	(2)	1	(2)	0	(0)	0	(0)
NASAL CAVITY/MUCOUS MEMBRANE	# Ex	50		50		50		50		50		50	
SQUAMOUS CELL CARCINOMA		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
ADENOMA, NOS		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
SQUAMOUS METAPLASIA		0	(0)	2	(4)	0	(0)	0	(0)	0	(0)	0	(0)
METAPLASIA, NOS		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
INFLAM., ACUTE		6	(12)	3	(6)	7	(14)	4	(8)	5	(10)	7	(14)
INFLAM., ACT-CHR.		4	(8)	13	(26)	7	(14)	11	(22)	6	(12)	3	(6)
INFLAM., CHRONIC		0	(0)	2	(4)	2	(4)	2	(4)	0	(0)	1	(2)
INFLAM., HEMORRHAGIC		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
FOREIGN BODY, NOS		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	1	(2)
HEMORRHAGE		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)

(Report Continued)

Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

PROJECT ID. NO: EDC
PAGE 27

FATES: ALL
DAYS: ALL
SEX: MALE

GROUP:		CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:		50		50		50		50		50		50	
		#	%	#	%	#	%	#	%	#	%	#	%
MEDIASTINAL LYMPH NODE	# Ex	3		8		8		7		6		5	
DEGENERATION, CYSTIC		2	(67)	0	(0)	5	(63)	2	(29)	2	(33)	2	(40)
HEMORRHAGE		0	(0)	2	(25)	1	(13)	2	(29)	0	(0)	2	(40)
CONGESTION		0	(0)	5	(63)	2	(25)	3	(43)	3	(50)	1	(20)
PIGMENT		0	(0)	1	(13)	0	(0)	0	(0)	0	(0)	0	(0)
HYPERPLASIA, PLASMA CELL		1	(33)	0	(0)	0	(0)	1	(14)	0	(0)	0	(0)
LARYNX	# Ex	49		50		50		50		49		48	
INFLAM., ACUTE		0	(0)	0	(0)	1	(2)	0	(0)	1	(2)	0	(0)
INFLAM., SUBACUTE		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
SKIN	# Ex	50		49		49		50		50		50	
SEBACCEOUS ADENOMA		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
KERATOACANTHOMA		1	(2)	3	(6)	1	(2)	2	(4)	3	(6)	2	(4)
SQUAMOUS CELL PAPILLOMA		0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
SQUAMOUS CELL CARCINOMA		0	(0)	0	(0)	0	(0)	1	(2)	1	(2)	0	(0)
TRICHOFOLLICULOMA		1	(2)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
TRICHOEPITHELIOMA		0	(0)	0	(0)	0	(0)	1	(2)	1	(2)	0	(0)
CYST, EPITHELIAL		0	(0)	2	(4)	0	(0)	1	(2)	3	(6)	0	(0)
ABSCESS, NOS		0	(0)	1	(2)	0	(0)	0	(0)	1	(2)	0	(0)
INFLAM., NECROTIZING		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
FOREIGN BODY REACTION		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
INFLAM., ACT-CHR.		0	(0)	1	(2)	1	(2)	0	(0)	0	(0)	0	(0)
ULCER, NOS		0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
INFLAM., CHRONIC		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	2	(4)

(Report Continued)

Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

PROJECT ID. NO: EDC FATES: ALL
PAGE 28 DAYS: ALL SEX: MALE

GROUP:		CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:		50		50		50		50		50		50	
		#	%	#	%	#	%	#	%	#	%	#	%
SUBCUTIS	# Ex	50		50		49		50		50		50	
SARCOMA, NOS		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	1	(2)
FIBROMA, NOS		2	(4)	1	(2)	0	(0)	10	(20)	3	(6)	2	(4)
HEMANGIOMA		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
LIPOMA		0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
FIBROSARCOMA		1	(2)	0	(0)	0	(0)	1	(2)	1	(2)	0	(0)
CARCINOSARCOMA		0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
NEUROFIBROMA		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
ABSCESS, NOS		1	(2)	0	(0)	0	(0)	1	(2)	3	(6)	2	(4)
HEMORRHAGE		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
MESENCHYMAL TUMOR		0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
HEMANGIOSARCOMA		0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
NASAL ASSOCIATED STRUCTURES	# Ex	15		24		15		24		20		23	
ODENTOGENIC TUMOR, MAXILLA		0	(0)	0	(0)	0	(0)	2	(8)	0	(0)	0	(0)
FIBROSARCOMA, MAXILLA		0	(0)	0	(0)	1	(7)	0	(0)	0	(0)	0	(0)
OSTEOGENIC SARCOMA, MAXILLA		0	(0)	0	(0)	0	(0)	0	(0)	1	(5)	0	(0)
ABSCESS, NOS, TOOTH		3	(20)	9	(38)	6	(40)	5	(21)	3	(15)	8	(35)
DEFORMITY, TOOTH		12	(80)	20	(83)	10	(67)	16	(67)	12	(60)	19	(83)
INFLAM.ACT-CHR.LACRIMAL DUCT		6	(40)	12	(50)	5	(33)	7	(29)	4	(20)	5	(22)
INFLAM.CHR., LACRIMAL DUCT		1	(7)	3	(13)	1	(7)	5	(21)	6	(30)	5	(22)
INFLAM. ACUTE, LACRIMAL DUCT		0	(0)	0	(0)	4	(27)	1	(4)	2	(10)	1	(4)
SQUAM. METAPL. LACRIMAL DUCT		0	(0)	0	(0)	1	(7)	0	(0)	0	(0)	0	(0)
OSTEOMALACIA, MAXILLA		1	(7)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
SEMINAL VESICLE	# Ex	4		1		4		4		3		3	
INFLAM., ACT-CHR.		0	(0)	0	(0)	1	(25)	0	(0)	0	(0)	0	(0)
INFLAMMATION, ACUTE		0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(33)
INFLAMMATION, CHRONIC		0	(0)	0	(0)	1	(25)	0	(0)	0	(0)	0	(0)
ATROPHY		1	(25)	0	(0)	1	(25)	4	(100)	2	(67)	1	(33)
RETENTION OF CONTENT		0	(0)	1	(100)	1	(25)	0	(0)	0	(0)	0	(0)

(Report Continued)

Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

PROJECT ID. NO: EDC
PAGE 29

FATES: ALL
DAYS: ALL
SEX: MALE

GROUP:		CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:		50		50		50		50		50		50	
		#	%	#	%	#	%	#	%	#	%	#	%
EYE	# Ex	4		1		3		0		1		5	
INFLAM., ACUTE, CORNEA		1	(25)	0	(0)	0	(0)	0		0	(0)	1	(20)
INFLAM., ACUTE, IRIS		1	(25)	0	(0)	0	(0)	0		0	(0)	0	(0)
INFLAM., CHR., LACRIMAL GL.		0	(0)	1	(100)	0	(0)	0		0	(0)	0	(0)
CATARACT, NOS, LENS		0	(0)	0	(0)	1	(33)	0		1	(100)	1	(20)
ATROPHY		0	(0)	0	(0)	0	(0)	0		0	(0)	1	(20)
CONJUNCTIVA *	# Ex	2		1		0		1		2		2	

(Report Continued)

* All tissues examined were normal.

Project Summary Table

SUMMARY: Incidence of NEOPLASTIC and NON-NEOPLASTIC Microscopic Findings

PROJECT ID. NO: EDC FATES: ALL
PAGE 30 DAYS: ALL SEX: MALE

GROUP:	CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
NUMBER OF ANIMALS:	50		50		50		50		50		50	
	#	%	#	%	#	%	#	%	#	%	#	%
OTHER TISSUES AND LESIONS:												
HEMATO. SYST. LEUKEMIA, NOS	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
HEMATO. SYST.,LYMPHOMA, LYMPH	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
MESENTERIC ART., PERIARTERITIS	1	(2)	1	(2)	0	(0)	0	(0)	4	(8)	0	(0)
MESENTERY, SCLEROSIS, FIBROSIS	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
PERITONEUM HYPERPL.MESOTHELIUM	0	(0)	1	(2)	0	(0)	1	(2)	0	(0)	0	(0)
PERITONEUM FIBROMA	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
FATTY TISSUE, LIPOMA	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
FATTY TISSUE, NECROSIS, FAT	1	(2)	1	(2)	1	(2)	0	(0)	1	(2)	1	(2)
PREPUT/CLIT GL, ADENOMA, NOS	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
PREPUT/CLIT GL, INFLAM.ACT-CHR	1	(2)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
PREPUT/CLIT GL, SQUAM. CL CA	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
PREPUT/CLIT GL, ABSCESS,NOS	1	(2)	0	(0)	1	(2)	0	(0)	1	(2)	0	(0)
PREPUT/CLIT GL, RETENT.OF CONT	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
PREPUT/CLIT GL, INFLAM.CHRONIC	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
TONGUE, SQUAMOUS CELL CA	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)
L.N.TRACH-BRONCH,HYPERPL.LYMPH	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
FOOT, ABSCESS	0	(0)	0	(0)	1	(2)	0	(0)	1	(2)	0	(0)
FOOT, ULCER, NOS	6	(12)	0	(0)	2	(4)	0	(0)	3	(6)	3	(6)
FOOT, INFLAM., ACT-CHR.	1	(2)	0	(0)	4	(8)	0	(0)	0	(0)	1	(2)
ZYMBALS GLAND, ADENOMA, NOS	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
ZYMBALS GLAND, SQUAM. CELL CA	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)
SKELETAL MUSCLE, DEGENERATION	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
HARD PALATE, ULCER, NOS	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)	1	(2)
HARD PALATE, HEMORRHAGE	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)
HARD PALATE, INFLAM., ACT-CHR.	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
JOINT, INFLAM., CHRONIC	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	3	(6)
HARD PALATE, INFLAM., CHRONIC	0	(0)	1	(2)	0	(0)	1	(2)	0	(0)	0	(0)
CAROTID ARTERY, PERIARTERITIS	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)
SKEL. MUSCLE, HEMORRHAGE,ACUTE.	0	(0)	1	(2)	0	(0)	0	(0)	0	(0)	0	(0)
GINGIVA, SARCOMA, NOS	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
HARDERIAN GL.,SQUAMOUS CELL CA	0	(0)	0	(0)	0	(0)	0	(0)	0	(0)	1	(2)
HARD PALATE, SQUAMOUS CELL CA	0	(0)	0	(0)	0	(0)	1	(2)	0	(0)	0	(0)

(End of Report)

IV. SUMMARY TUMOR INCIDENCE

PATHOLOGY ASSOCIATES, INC.

WORK ASSIGNMENT EDC
SPRAGUE-DAWLEY RATS
MRI/NIOSH

Summary Tumor Incidence

PROJECT ID: EDC FATES: ALL
PAGE 1 DAYS: ALL SEX: FEMALE

GROUP:	CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
	#	%	#	%	#	%	#	%	#	%	#	%
Total Animals/Group	50		49		49		50		50		50	
Total Primary Tumors	85	(170)	63	(129)	72	(147)	105	(210)	87	(174)	80	(160)
Total Animals with Tumors	47	(94)	46	(94)	41	(84)	46	(92)	47	(94)	47	(94)
Total Animals w/ Multiple Tumors	28	(56)	14	(29)	20	(41)	33	(66)	26	(52)	22	(44)
Total Benign **	70	(82)	58	(92)	61	(85)	82	(78)	72	(83)	73	(91)
Total Malignant **	15	(18)	5	(8)	11	(15)	23	(22)	15	(17)	7	(9)
Total Malignant with Metastasis *	2	(13)	2	(40)	2	(18)	4	(17)	1	(7)	1	(14)

** Percentage value is Total Benign or Malignant Tumors divided by the Total Primary Tumors

* Percentage value is Total Metastasized Tumors divided by the Total Malignant Tumors

(End of Report)

PATHOLOGY ASSOCIATES, INC.

WORK ASSIGNMENT EDC
SPRAGUE-DAWLEY RATS
MRI/NIOSH

Summary Tumor Incidence

PROJECT ID: EDC
PAGE 1

FATES: ALL
DAYS: ALL

SEX: MALE

GROUP:	CONTROL		DS		ET		EDC/DS		EDC		EDC/ET	
	#	%	#	%	#	%	#	%	#	%	#	%
Total Animals/Group	50		50		50		50		50		50	
Total Primary Tumors	69	(138)	53	(106)	88	(176)	102	(204)	86	(172)	69	(138)
Total Animals with Tumors	42	(84)	32	(64)	42	(84)	45	(90)	45	(90)	42	(84)
Total Animals w/ Multiple Tumors	17	(34)	15	(30)	25	(50)	29	(58)	29	(58)	17	(34)
Total Benign **	64	(93)	45	(85)	74	(84)	84	(82)	74	(86)	55	(80)
Total Malignant **	5	(7)	8	(15)	14	(16)	18	(18)	12	(14)	14	(20)
Total Malignant with Metastasis *	0	(0)	1	(13)	1	(7)	4	(22)	0	(0)	2	(14)

** Percentage value is Total Benign or Malignant Tumors divided by the Total Primary Tumors

* Percentage value is Total Metastasized Tumors divided by the Total Malignant Tumors

(End of Report)