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BROAD SCAN ANALYSIS OF HUMAN ADIPOSE TISSUE: VOLUME II: VOLATILE ORGANIC COMPOUNDS

by

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PREFACE

This report is the second of a five-volume series that details the broad scan chemical analysis of composite adipose tissue samples. These composite samples were prepared from individual specimens obtained from the Environmental Protection Agency's (EPA) National Human Adipose Tissue Survey (NHATS) fiscal year 1982 (FY82) repository.

This volume summarizes data generated from the analysis of the composited samples for volatile organic compounds. Volume I, the executive summary, presents a synopsis of all analysis efforts completed under the broad scan program. Volumes III through V deal specifically with the chemical analysis of the NHATS composites for general semivolatile organic compounds, polychlorinated dibenzo-p-dioxins (PCDD), and dibenzofurans (PCDF), and trace elements. The statistical analyses of the data reported in these volumes will be reported separately by the EPA's Office of Toxic Substances (OTS) Design and Development Branch contractor, Battelle Columbus Laboratories.

The entire series of reports are referenced as follows:

- Stanley JS. 1986. Broad scan analysis of human adipose tissue: Volume I: Executive summary. EPA 560/5-86-035.
- Stanley JS. 1986. Broad scan analysis of human adipose tissue: Volume II: Volatile organic compounds. EPA 560/5-86-036.
- Stanley JS. 1986. Broad scan analysis of human adipose tissue: Volume III: Semivolatile organic compounds. EPA 560/5-86-037.
- Stanley JS. 1986. Broad scan analysis of human adipose tissue: Volume IV: Polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF). EPA 560/5-86-038.
- Stanley JS, Stockton RA. 1986. Broad scan analysis of human adipose tissue: Volume V: Trace elements. EPA-560/5-86-039.

These method development, sample analyses, and reporting activities were completed for the EPA/OTS Field Studies Branch (FSB) broad scan analysis of human adipose tissue program (EPA Prime Contract Nos. 68-02-3938 and 68-02-4252, Work Assignments 8 and 21, respectively, Ms. Janet Remmers, Work Assignment Manager, and Dr. Joseph Breen, Project Officer).

The samples were prepared with the assistance of Ms. Leslie Moody and Mr. Steven Turner. The HRGC/MS methods development and sample analyses were conducted by Mr. Steven Turner, Ms. Margaret Wickham, and Mr. Gil Radolovich. The compositing scheme used to prepare the samples from the NHATS repository was provided by Dr. Gregory Mack, Battelle Columbus Laboratories, under contract to the EPA/OTS Design and Development Branch (Mr. Philip Robinson, Task Manager, and Ms. Cindy Stroup, Program Manager).

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EXECUTIVE SUMMARY

The U.S. Environmental Protection Agency's Office of Toxic Substances (EPA/OTS) maintains a unique program for monitoring human exposure to potentially toxic substances. The National Human Adipose Tissue Survey (NHATS) is a statistically designed annual program to collect and analyze a nationwide sample of adipose tissue specimens for toxic compounds. The primary focus for NHATS has been to document trends in human exposure to environmentally persistent contaminants, specifically organochlorine pesticides and polychlorinated biphenyls (PCBs).

EPA/OTS has recognized the need to provide a more comprehensive assessment of the toxic substances that accumulate in adipose tissue. Thus, the NHATS specimens collected during fiscal year 1982 (FY82) were designated for "broad scan analysis" to determine volatile and semivolatile organic compounds and trace elements.

This volume of the final report deals specifically with the measurement of volatile organic chemicals in composited adipose tissue specimens from the FY82 NHATS repository. The objectives of this part of the study were (1) to develop an analytical method based on high resolution gas chromatography/mass spectrometry (HRGC/MS) for determination of volatile organic chemicals in human adipose tissue and (2) to complete the analysis of the FY82 NHATS specimens as composited for volatile organic compounds.

The analytical method developed to sample volatile organic compounds from human adipose tissue is based on a heated dynamic headspace purge and trap technique. The volatile organic compounds were separated and detected using HRGC/MS. HRGC was selected to achieve the best possible separation of volatile components, and MS was selected to provide the necessary specificity to identify positively the volatile compounds present in the tissue. Target analytes were quantitated based on a multiple internal standard technique. The method evaluation studies and daily quality control checks demonstrated that method accuracy was improved for analytes which had a corresponding deuterated analog as an internal quantitation standard.

Forty-six composite samples were prepared from the FY82 NHATS repository according to a study design prepared by the EPA/OTS Design and Development Branch contractor, Battelle Columbus Laboratories. The composite samples represent the nine U.S. census divisions, stratified by three age groups (0-14, 15-44, and 45 plus).

The HRGC/MS analysis of the volatile compounds purged from the human adipose demonstrated a complex mixture of compounds consisting primarily of aldehydes, ketones, hydrocarbons, and carboxylic acid esters. Additional compounds classified as aromatic, halogenated aliphatic, and halogenated aromatic compounds were detected as minor constituents.

Quantitative efforts focused on target analytes classified as priority pollutants. Quantitative data are reported for 17 specific compounds. The predominant target analytes noted included chloroform, 1,1,1-trichloroethane, benzene, tetrachloroethene, toluene, chlorobenzene, ethylbenzene,

styrene, 1,1,2,2-tetrachloroethane, 1,4-dichlorobenzene, 1,2-dichlorobenzene, xylenes, and ethyl phenol. In all composite samples several compounds were detected including styrene, the xylene isomers, 1,4-dichlorobenzene, and ethyl phenol. The frequencies of detection for each of the compounds by age groups and census divisions are detailed in the report. The volatile organic compounds were detected in the composites from all census divisions and age group.

The quantitative data for the 17 specific compounds have been submitted along with all supporting quality control data to the OTS design and development contractor, Battelle Columbus Laboratories, for statistical analysis.

Characterization of additional chromatographic peaks in the HRGC/MS data to identify other compounds of interest to the Agency has been initiated under a separate work assignment (Contract No. 68-02-4252, Work Assignment No. 23).

I. INTRODUCTION

The National Human Adipose Tissue Survey (NHATS) is the main operative program of the National Human Monitoring Program. The National Human Monitoring Program was first established by the U.S. Public Health Service in 1967 and was subsequently transferred to the U.S. Environmental Protection Agency (EPA) in 1970. During 1979 the program was transferred within EPA to the Exposure Evaluation Division (EED) of the Office of Toxic Substances (OTS).

NHATS is an annual program to collect a nationwide sample of adipose tissue specimens and to chemically analyze them for the presence of toxic compounds. The objective of the NHATS program is to detect and quantify the prevalences of the compounds in the general population. The NHATS data are used to address part of OTS's mandate under the Toxic Substances Control Act (TSCA) to assess chemical risk to the U.S. population. The specimens are collected from autopsied cadavers and surgical patients according to a statistical survey design (Lucas, Pierson, Meyers, Handy 1981). The survey design ensures that specified geographical regions and demographic categories are appropriately represented to permit valid and precise estimates of baseline levels, time trends, and comparisons across subpopulations.

The data for the NHATS are generated by collecting and chemically analyzing adipose tissue specimens for selected toxic substances. Historically, organochlorines and polychlorinated biphenyls (PCBs) have been selected for evaluation.

A. Broad Scan Analysis Strategy

EPA/OTS has recognized the need to provide a more comprehensive assessment of the toxic substances that accumulate in adipose tissue. An aggressive strategy to assess TSCA-related substances that persist in the adipose tissue of the general U.S. population has been developed by EED. The NHATS specimens collected during fiscal year 1982 (FY82) were selected for a broad scan analysis of volatile and semivolatile organic TSCA-related chemicals and trace elements (Mack, Stanley 1984).

The initiative to achieve a more comprehensive assessment necessitated either the development of new methods or the modification of the existing analytical procedures, specifically high resolution gas chromatography/mass spectrometry (HRGC/MS). Data on organochlorine pesticides and PCBs reported for the NHATS specimens up to the FY82 collection are based on packed column gas chromatography/electron capture detector (PGC/ECD) analysis.

B. Work Assignment Objectives

The objectives of this phase of the work assignment were (1) to identify appropriate analytical methods for a broad scan analysis of volatile organic compounds in human adipose tissue based on HRGC/MS detection; (2) to conduct preliminary evaluation of the analytical procedures, and (3) to complete the sample workup and HRGC/MS analysis of 46 composite samples prepared from the NHATS specimens collected during FY82. The target detection range for analytes by the HRGC/MS as specified in the current NHATS strategy (Mack, Stanley 1984) was 0.05 to 0.10 μg/g.

C. Background Information

The exposure of the general U.S. population to volatile organic compounds has not previously been addressed through a national sampling of biological matrices (breath, blood or tissue). Specific studies have been conducted, however, to determine the effects of exposure to chemical solvents, monomers such as vinyl chloride and styrene in the plastics industry, and anesthetics (Wolff 1976; Wolff, Loumer, Selikoff, Aubrey 1977; Engstrom, Riihimäki 1979; Engstrom 1984).

The fact that blood and breath levels of volatile organics can be detected at declining levels from several hours to several days after a specific exposure incident indicate tissue retention (Whitcher, Cohen, Trudell 1971; Corbett 1973; Wolff 1976). Human adipose tissue has been evaluated as a depot for storage and release of volatiles in specific exposure studies of workers to styrene and ethylbenzene in the polymerization industry (Wolff 1976; Wolff, Daum, Loumer, Selikoff, Aubrey 1977; Engstrom 1984).

Several analytical procedures have been developed for the measurement of specific compounds from these exposure scenarios. Analytical techniques have required dissolution of milligram quantities of adipose into carbon disulfide, or other suitable solvent, followed by direct injection onto gas chromatographic (GC) columns with flame ionization/electron capture, microcoulometric or mass spectrometer (MS) detectors. Other analytical procedures combined with these detection systems have included: (a) static headspace analysis of heated tissue, (b) stripping volatiles from heated tissue by flowing an inert gas directly through the rendered sample, (c) vacuum distillation and cryogenic focusing of the analytes on a high resolution gas chromatography (HRGC) column, and (d) dynamic solution purge and trap and headspace analysis of heated tissue water mixtures combined with cryogenic focusing and HRGC analysis. Each of these techniques has certain advantages and disadvantages in terms of complexity of the actual sampling procedure and sensitivity and selectivity of the detector (Novotny, McConnell, Lee, Farlow 1974; Politzer, Githens, Dowty, Laseter 1975; Luskus, Kilian, Lackey, Biggs 1977; Snyder, Erlichman, Goldstein, Laskin 1977; Karbowski, Braun 1978; Peoples, Pfaffenberger, Enos, Shafik 1978; Balkon, Leary 1979; Peoples, Pfaffenberger, Shafik, Enos 1979; Pfaffenberger, Freal 1979; Michael, Erickson, Parks, Pellizzari 1980; Pantarotto, Fanelli, Belletti, Bidoli 1980; Reddrop, Riess, Slater 1980; Vogt, Liao, Sun 1980; Zuccato, Marcucci, Mussini 1980; Lin, Fu, Bruckner, Feldman 1982; Hiatt 1981; Reinert, Hunter, Sabatino 1983).

An analytical method for the measurement of volatile organic chemicals in human adipose tissue has been developed as a result of this work assignment. This analytical method is a modification of a dynamic headspace purge and trap procedure (Michael, Erickson, Parks, Pellizzari 1980) combined with high resolution gas chromatography and mass spectrometry. This report describes the method and summarizes the volatile organic data for 46 composite specimens from the FY82 NHATS repository determined with the method.

Following this introductory section, Section II presents recommendations for further activities for volatile organics. Section III is the

experimental section and describes the collection and storage of the NHATS specimens, the adipose tissue compositing procedures, the development of the analytical method, and the routine analytical procedures. Section IV presents the results of the composite tissue analyses. Section V summarizes the quality control (QC) procedures and results. Section VI contains references. Appendices A, B, and C provide, respectively, the volatile organic analysis method in detail, additional data tables on the results of the analyses, and the exact compositing scheme used for the FY82 NHATS specimens.

II. RECOMMENDATIONS

Further analytical development should be pursued to improve the determination of volatile organic compounds in human adipose tissue samples. These improvements should specifically include smaller sample sizes (1.0 to 5.0 g), more efficient transfer of volatile organics onto the HRGC column, and further development of the isotope dilution quantitation technique. These modifications can possible be achieved by using widebore HRGC columns and/or cryofocusing techniques.

The analytical method should be modified to provide quantitative information on compounds of greater volatility than chloroform (such as methylene chloride, vinyl chloride, etc.). This possibly could be accomplished by conducting two analyses on each tissue sample. The first analysis should be conducted for the more volatile compounds with the sample heated in the range of 50-80°C and the headspace sampled for 15 min or less. The second sample analysis should be conducted with the procedures specified in this report to provide quantitative data for compounds ranging in volatility from chloroform through the dichlorobenzene isomers.

Stability studies should be conducted to determine the effects of long-term storage at subzero temperature, and repeated thawing and freezing on the integrity of the volatile organic content in the sample. The results of the sample analysis conducted for the FY82 composites indicate considerable differences in the absolute quantities of the major volatile constituents (hydrocarbons, aldehydes, ketones, etc.) for samples analyzed within 6 mo of collection and the NHATS specimens that have been archived prior to analysis for up to 2 yr.

III. EXPERIMENTAL

This section of the report describes:

A. collection and storage of NHATS specimens;
B. sample compositing activity;
C. sources and preparation of analytical standards;
D. apparatus;
E. analysis procedures;
F. quality control procedures;
G. data interpretation; and
H. method validation.

A. Collection and Storage of NHATS Specimens

The adipose specimens were originally collected during FY82 (October 1, 1981, through September 30, 1982) for determination of organic chlorine pesticide and PCB residues. The specimens were collected during surgical procedures or as part of postmortem examinations. The cooperating physicians and pathologists were requested to acquire at least 5 g of high lipid adipose (subcutaneous, perirenal, or mesenteric), taking precautions to avoid contamination that might result in direct contamination from chemicals such as solvents, paraffin, disinfectants, preservatives, or plastics. The cooperators were given no specific instructions to avoid potential contamination that might arise from background contribution of solvents or metals.

The adipose tissue specimens were sealed in glass jars and frozen (-20°C) following collection. The specimens were shipped in insulated coolers packed on dry ice. The FY82 specimens were originally received and stored at EPA's Toxicant Analysis Center (TAC) at Bay St. Louis, MS. The NHATS repository was transferred to Midwest Research Institute (MRI) during September 1982. The specimens were shipped in insulated coolers and packed on dry ice. The specimens were inventoried at MRI upon receipt and were then stored in freezers (-20°C). Precautions were taken to ensure that the specimens remained frozen during all inventory and sample handling procedures.

B. Sample Compositing Activity

The NHATS FY82 adipose tissue specimens were subsampled and composited as specified by EPA's Design and Development Branch contractor, Battelle Columbus Laboratories (BCL). Prior to preparation of the composites, all of the FY82 specimens were retrieved from the NHATS repository and the individual specimens bottles were grouped according to the designated compositing scheme provided by BCL. Care was taken to ensure that the specimens were not allowed to reach room temperature. The specimen were stored on dry ice during this process and were returned to a freezer (-20°) once all individual specimen for a specific composite had been located.

All specimens for a specific composite were removed from the freezer at the same time for the compositing effort. The specimens were placed on dry ice so they would remain frozen during the compositing effort. Each specimen was handled separately and each was subsampled for the composites for both volatile and semivolatile organic anlaysis. This resulted in minimum handling of each specimen. Once the speciment had been subsampled for each composite it was placed on dry ice. After all specimen had been added to the composites, the batch was returned to the freezer.

All samples were handled in a positive pressure Plexiglas hood of approximately 94.5 L volume to prevent contamination from laboratory air. Compressed air was filtered through a charcoal trap to remove potential volatile contaminants from air supply before it entered the hood. The subsamples were manipulated with the rounded end of a lab spoon-type stainless steel spatulas and placed in 40-mL vials with TFE septa caps. Each specimen was manipulated with a separate clean spatula. All weighings were performed to ± 0.1 g on a Mettler open pan balance placed in the hood.

The nominal mass of each individual specimen necessary to achieve a final composite mass of 20 g was determined before proceeding with the physical compositing. For example, if a composite consisted of 20 specimens, 1.0 g of each specimen was necessary to achieve a final composite mass of 20 g. Separate composite samples were prepared for both semivolatile (Stanley 1986c) and volatile organic analysis. The individual specimens were added first to the composites for the semivolatile organic analysis. This resulted in the addition of a total available specimen, in some cases, to the semivolatile organic composite only. As a result, several of the volatile organic composites contain somewhat less than the target 20 g of tissue mass. The samples resulting from the 46 volatile organic composites ranged from 5.1 to 25.6 g total mass with an average mass of 19 g. Appendix C provides a summary of the exact compositing scheme for both the volatile and semivolatile organic analyses.

Prior to the compositing effort, the vials were washed in soap and water, rinsed thoroughly with tap water, deionized water, bulk acetone, Burdick and Jackson (B&J) acetone, and B&J hexane, and then placed in an oven at 200°C for 48 h before use. The spatulas were washed and rinsed as above and were dried for at least 5 min in the oven.

All composites were stored on dry ice until transfered to a freezer (-20°C). Before being placed in the freezer in the 40-ml vials, the composited samples were grouped by census division and placed in 1.0-qt jars (cleaned as above) containing a layer of activated charcoal and closed with a TFE-lined cap. The samples were stored in the freezer until analysis.

As a QA/QC check, six of the empty vials used for compositing were placed in the hood on the weighing balance for approximately 15 min (approximating the time needed for compositing), and then were capped, sealed, and stored with the samples. These blank vials were included with the analysis of the composited specimen as method blanks.

The samples resulting for the 46 composites ranged from 5.1 to 25.6 g total mass with an average mass of 19 g. Appendix C provides a summary of the exact compositing scheme.

C. Sources and Preparation of Analytical Reagents

The sources of the internal standards and reference compounds and the procedures for preparing spiking and calibration standards are described below.

1. Internal Quantitation Standards

A three-component internal quantitation standard mixture was obtained from Supelco, Inc. (Catalog No. 4-8823, Lot No. LA 11802). This mixture contained bromochloromethane, 1,4-dichlorobutane, and 1-chloro-2-bromopropane at 20 mg/mL each in 1.0 mL of methanol. This mixture was used as received and was stored in the freezer in its original resealable ampule.

A second stock solution of deuterated internal quantitation standards was prepared from the compounds listed below by aliquoting each with a 100-µL syringe into a 10-mL volumetric flask and diluting to the mark with methanol (B&J high purity, Lot No. AJ029). The volume of each compound necessary to achieve the desired concentration was determined by the density of the specific compound. The final concentration was approximately 10 mg/mL for each deuterated internal standard. Because the 1,4-d_4-dichlorobenzene is a solid, a separate stock was prepared in methanol before addition to the solution containing the other deuterated analogs. The final mixture was sealed in two 5-mL vials and stored in the freezer until just prior to use.

Compound	Supplier
d_6-benzene	Aldrich Gold Label (99.5% D) No. 15, 181-5
d-chloroform	Aldrich Gold Label (99.8% D) No. 15, 182-3
1,1,2,2-d_2-tetrachloroethane	M and D Isotopes No. MD-1416
d_2-methylene chloride	M and D Isotopes No. MD-53
d_5-chlorobenzene	KOR Isotopes (99% D_5) No. 521510
1,4-d_4-dichlorobenzene	KOR Isotopes (98% D_4) No. 521530
d_{10}-ethylbenzene	KOR Isotopes (98% D_{10}) No. 521443
d_8-toluene	KOR Isotopes (99.9% D_8) No. 510041
d_{10}-p-xylene	KOR Isotopes (98% D_{10}) No. 521133

2. Reference Compounds

Several compounds characteristic of aromatic compounds, chlorinated and brominated aliphatic compounds, and chlorinated aromatic compounds were selected for preparation of analytical standards. These reference compounds were also selected as a preliminary list of target analytes as a result of their presence in tissue from the preliminary method development and their classification as priority pollutants.

The compounds listed below were aliquotted with a 100-µL syringe into a 10-mL volumetric flask that was partially filled (approximately 5 mL) with methanol. The volume of each compound necessary to achieve the desired concentration was determined from the density of each specific compound. The solution was diluted to the mark and stored in the same manner as the internal quantitation standard solutions. The compounds were aliquotted to obtain a final stock concentration of approximately 10 mg/mL for each compound.

Compound	Supplier
bromoform	Aldrich Gold Label (99%/1% EtOH)
dibromochloromethane	Columbia No. D1843
toluene	B&J H.P. No. A1-857
1,1,2-trichloroethane	Aldrich No. JB-070177 (95%)
styrene	Eastman No. 1465
tetrachloroethylene	Aldrich Gold Label No. 120457
bromodichloromethane	Aldrich No. 7628AH (98%)
chlorobenzene	Aldrich No. 120277 (99%)
1,2-dichlorobenzene	Aldrich No. D5-680-2 (98%)
ethylbenzene	Aldrich No. E1-250-8 (99%)

Compound	Supplier
1,1,2,2-tetrachloroethane	Baker No. 017386
1,1,1-trichloroethane	Fisher No. 775974
chloroform	B&J H.P. (1% EtOH preservative) No. AG594
benzene	MCB Pest. Grade No. U2738
carbon disulfide	Mallinckrodt No. KMEE

3. Spiking Solutions

The reference stock solution and the two internal quantitation standard stock solutions (Supelco mixture and the deuterated analog mixture) were used to make up the spiking solutions necessary for HRGC/MS analysis. The three separate stock solutions allowed manipulation of the concentrations of the spiking levels to verify method calibration and accuracy of the analyses from spiked tissue and blank samples.

Spiking solutions were prepared fresh weekly from the three stock solutions. The spiking solutions were prepared in 1.0-mL microreaction vials (Supelco No. 3-3292) with Mininert Valves (Supelco No. 3-301). Tetraglyme was used as the solvent for the spiking solutions to enhance their stability. All spiking solutions were stored in the refrigerator and transported between the GC/MS facility and the laboratory on ice in a cooler. Following sample spiking, the solutions were immediately returned to the cooler.

The spiking solutions were prepared by aliquoting tetraglyme into the 1.0-mL reaction vials and then spiking the tetraglyme with the stock solutions. For example, a 500-ng/µL internal standard spiking solution was made by injecting 975 µL of tetraglyme with a 1.0-mL syringe (available from Supelco, Inc.) into the reaction vial and then injecting 25.0 µL of the three-component (20 mg/mL) Supelco internal quantitation standard stock solution into the tetraglyme. A 500-ng/µL spiking solution of the deuterated internal standards was similarly prepared by spiking 950 µL of tetraglyme with 50.0 µL of the 10-mg/mL deuterated internal standard stock solution.

The target analyte spiking solution was prepared in the same manner but at 100 ng/µL. This was accomplished by spiking 990 µL of tetraglyme with 10.0 µL of the target analyte stock solution.

When the actual sample analyses were initiated, only two spiking solutions were necessary. A 500-ng/µL solution of the three internal standards from the Supelco mixture and the nine deuterated internal standards were combined. This mixed internal quantitation standard solution was prepared with 925 µL of tetraglyme, 25.0 µL of the three-component Supelco standard, and 50.0 µL of the deuterated internal standard stock solution. The target analyte spiking solution was prepared at the 100-ng/µL level as described above.

D. Apparatus

The design of the dynamic headspace purge and trap system used to collect the volatile organics and the HRGC/MS system used for separating and identifying these compounds are described below.

1. Dynamic Headspace Purge and Trap System

Method development for volatile organic analytes in human adipose tissue led to the system shown in Figure 1. Several Wheaton purge and trap vessels (No. 991765) were modified for the analyses. The thermometer and funnel arms were cut near the vessel and replaced by 1/4-in. Kovar® to PX seal tubes (Ace Glass, Inc., No. PT.976). This allowed the inlet and outlet lines to be connected with standard 1/4-in. Swagelock® fittings and provided leak-tight connections.

The Wheaton vessel was connected to a hot water circulating bath (Haake, No. F4391) maintained at 95°C. Approximately 5 min was required for the solution within the vessel to reach the maximum purge temperature. The vessel was placed on a magnetic stirrer (Ace Glass, Inc., No. 12064-08), and a 1.0-in. TFE stirring bar agitated the solution. Helium was directed into the vessel to displace the headspace at 40 mL/min. All metal gas carrier lines beyond the vessel outlet were wrapped with heat tape maintained at 150°C to prevent condensation of the target analytes and internal standards. The effluent from the vessel line flowed into a column equipped with a stopcock and frit that contained 1.0 mL of volatile-free water. This column was used as a condenser to remove excess moisture from the purge gas. The outlet line from this purge tower was attached to a six-way Carle valve. A GC carrier gas line of helium was attached to the Carle valve. The Carle valve was attached to a glass-lined U-tube (1/8 i.d.) packed with a 1.0-in. plug of Tenax. Glass wool was used to maintain the position of the Tenax in the center of the U-tube. The U-tube was rapidly heated (within 5 to 8 s) to 250°C. A resistance circuit with a thermocouple was used to heat and regulate the U-tube's temperature. In the purge mode the Carle valve directed the purge gas and analytes into the U-tube, which was at ambient temperature. The analytes were trapped and the purge gas vented. The helium carrier gas was directed onto the HRGC column during the purge mode. After the purge time had elapsed, the Carle valve was switched to the desorb mode and the U-tube was heated to flash volatilize the analytes. The helium carrier gas was then routed through the U-tube in the opposite direction of the purge mode and directed onto the HRGC column.

2. High Resolution Gas Chromatography/Mass Spectrometry

The volatile organic compounds were analyzed using a Finnigan 9610 GC and a Finnigan 4000 quadrupole MS equipped with an INCOS data system. Separation of the volatile organic compounds was achieved with a Durabond DB-5 fused silica capillary column, 30 m x 0.25 mm, 0.25-μm film thickness (J&W Scientific, Rancho Cordova, CA). The capillary column was routed directly into the ion source. The helium carrier gas was adjusted at 12 psi head pressure. The GC was equipped with a Grob type split/splitless injector. The effluent from the adsorbent trap was adjusted to 5 to 10 mL/min and directed

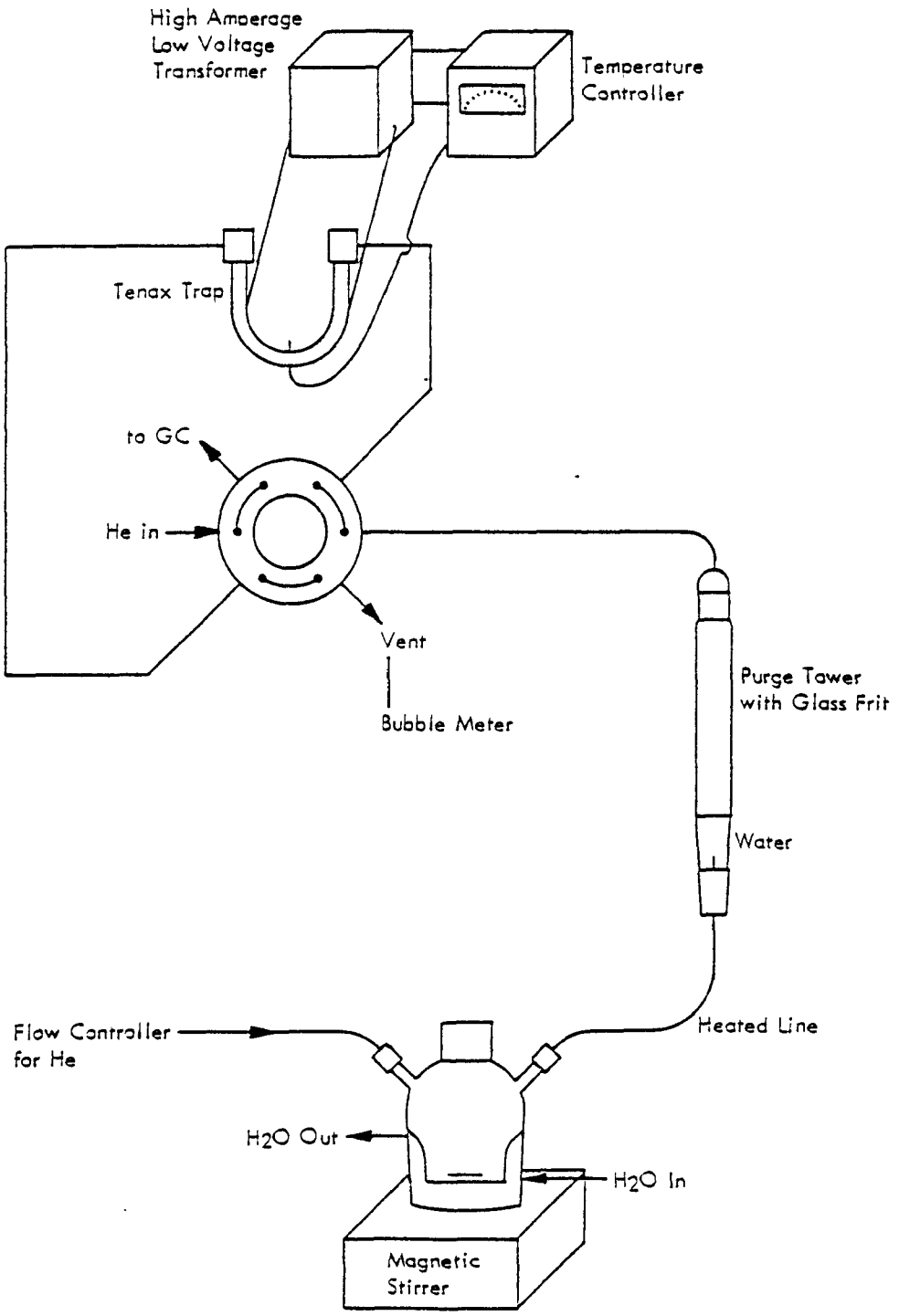


Figure 1. Schematic of apparatus for volatile organic analysis.

into the Grob injector with a syringe needle attached to the stainless steel tubing from the adsorbent trap. The injector was operated in the split mode with a 10:1 split ratio.

The GC was held isothermally at 30°C for 5 min and then programmed at 6°C/min up to 125°C where it was held for 10 min. Mass spectral data were acquired across the mass range of 35-275 amu for 20 min from initiation of the program. The HRGC column was programmed to 200°C between sample analyses as a precaution to ensure that all materials desorbed from the Tenax adsorbent had been eluted from the column prior to the next analysis.

E. Analysis Procedures

The procedures for spiking internal quantitation standards, the method blank analysis, generation of calibration curves, and composited sample analysis are described below.

1. Spiking Procedure

Internal quantitation standards and target analytes were added to the purge tower, method blanks, spiked adipose tissue matrix and composite samples using the following procedure. A 35-mm length of TFE tubing was inserted over the needle port on the Leur lock assembly of a 10.0-mL syringe. The syringe was filled with 3.0 mL of volatile organic-free water and the TFE tubing removed. The water in the syringe was spiked with the working standards (using a 5.0-µL syringe and needle) through the needle port, and the TFE tubing was replaced. An additional 2 mL of water and 1.0 mL of air was then drawn into the 10-mL syringe, and the syringe was inverted several times to ensure mixing of the tetraglyme and water solution. The contents of the syringe were quantitatively transferred to the sample vessel. The sample vessel was tightly capped and the sample was allowed to sit at room temperature for 30 min prior to initiating the analysis.

2. Method Blank Analysis

The Wheaton vessel was filled with 80 mL of the volatile organic-free water and spiked with 1.0 µg of each of the internal quantitation standards. The vessel was quickly capped and the gas flow turned on. The purge tower valve was kept in the off position, and the vessel and lines were leak checked with volatile organic-free water. Following the leak check, the purge tower valve was opened, the hot water bath valves opened, and the stirring bar turned on. The headspace above the stirred mixture was purged for 40 min and collected on the Tenax trap.

3. Calibration Curves for Reference Standards

Calibration curves for the compounds selected as reference standards were developed using a spiked human adipose tissue matrix. The spiked adipose tissue matrix is referred to as the tissue standard. A separate 20-g aliquot of a bulk adipose matrix was used to prepare each tissue standard. These tissue standards were prepared immediately prior to analysis. Preparation of the spiked tissue samples as homogenized matrices for repeated analysis was not evaluated in this study.

The analysis of the tissue standard was performed in the same way as the analysis of the blank but with 20 g of human adipose tissue added to the Wheaton vessel. A spatula was used to remove the frozen tissue from the sample vials. The tissue samples were spiked with 1.0 μg of each of the internal standards and 0.2 to 1.4 μg of each of the target analytes. Purge time was 40 min.

4. Composited Sample Analysis

The composited samples were analyzed in exactly the same manner as the tissue standard except that only the internal standard spiking solution was added to the aqueous mixture.

F. Quality Control Procedures

Figure 2 shows the general volatile organic analysis scheme and the related quality control (QC) procedures. Daily QC procedures included the analysis of reference standards and internal standards spiked in the purge tower (instrument performance check); a system blank with internal standards; a reference adipose tissue spiked with standards; and a QC sample. The QC sample consisted of either an additional instrument performance check to verify calibration or an adipose tissue spiked at a known level by the MS analyst. These QC samples were included for several days at the initiation of the analysis of the composites. Also, the MRI quality control coordinator (QCC) periodically submitted blind spikes to the MS analyst to assess instrument performance. These blind spikes were added to the purge tower before proceeding with the anlaysis.

The results of these analyses are provided in Section V. Before proceeding with the FY82 composite specimens, the MS analyst was required to complete successfully the analyses of check samples submitted by the QCC.

G. Data Interpretation

The HRGC/MS data for each sample were interpreted with computer-assisted quantitation routines. A mass spectral library and quantitation list of the target analytes, based on relative retention times and the primary characteristic ion, were used to search each data file.

1. Qualitative Identification

The automated search quantitation routine identified positive responses based on the primary characteristic ion for each of the target analytes. Table 1 provides a list of the target analytes, primary characteristic quantitation ions, internal standards, and the relative retention times. In addition to the automated search, the MS analyst identified compounds by reviewing the total mass spectra at the specified HRGC/MS scan number. This effort was required to avoid the inclusion of false positives in the sample set. The HRGC/MS data were also reviewed at ± 30 s of the retention time of each of the compounds to avoid reporting of false negatives.

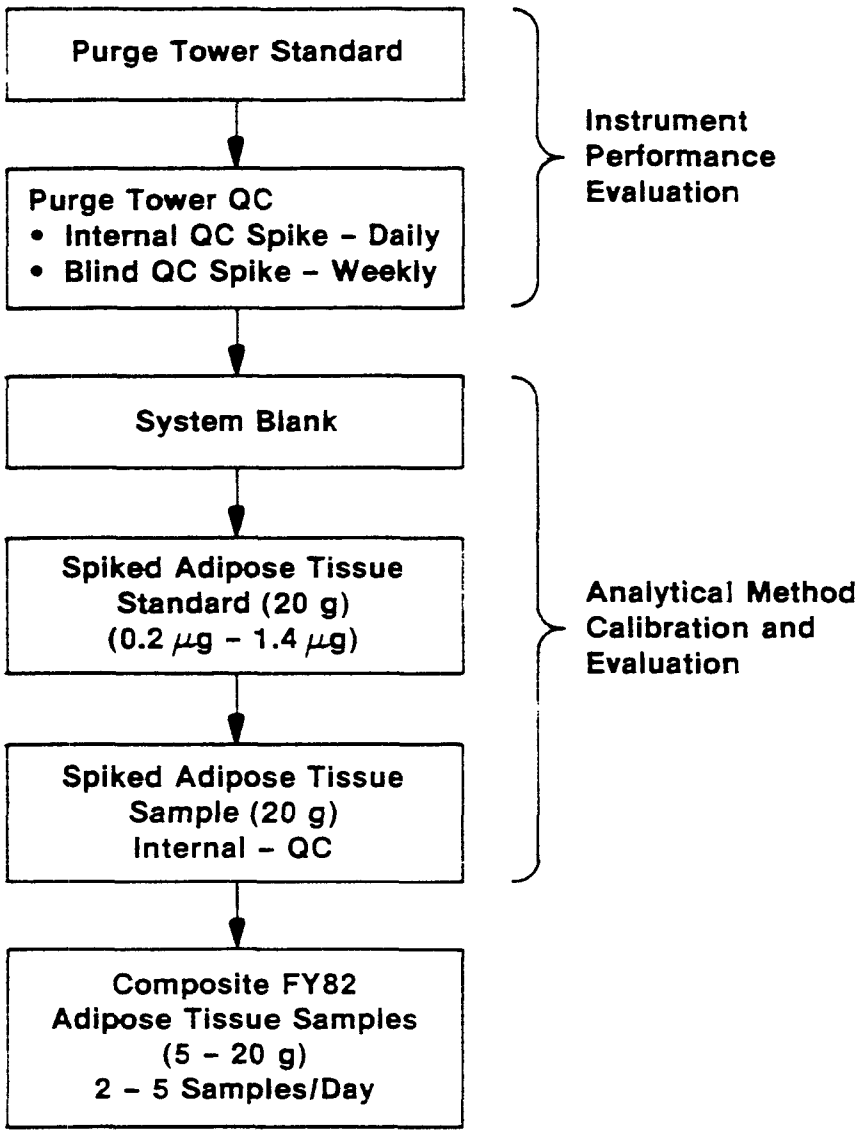


Figure 2. Analytical scheme for analysis of volatile organic compounds from human adipose tissue.

Table 1. Characteristic Ions, Internal Standards, and Relative Retention Times Used to Identify and Quantitate Target Analytes

Target analyte	Primary characteristic quantitation ion (m/z)	Internal quantitation standard[b]	RRT[a]
Bromochloropropane	77	Bromochloropropane	1.00
Chloroform	79	d-Chloroform	0.20-0.43
d-Chloroform	82		0.20-0.43
1,1,1-Trichloroehtane	97	Bromochloropropane	0.35-0.58
Bromodichloromethane	129	Bromochloropropane	0.53-0.76
Benzene	78	d_6-Benzene	0.39-0.62
d_6-Benzene	84		0.39-0.62
Tetrachloroethene	166	Bromochloropropane	1.16-1.39
Dibromochloromethane	129	Bromochloropropane	1.05-1.28
1,1,2-Trichloroethane	97	Bromochloropropane	0.88-1.11
Toluene	91	d_8-Toluene	0.83-1.07
d_8-Toluene	100		0.83-1.07
Chlorobenzene	112	d_5-Chlorobenzene	1.48-1.72
d_5-Chlorobenzene	117		1.48-1.72
Ethylbenzene	106	d_{10}-Ethylbenzene	1.62-1.85
d_{10}-Ethylbenzene	116		1.62-1.85
Bromoform	173	Bromochloropropane	1.79-1.96
Styrene	104	Bromochloropropane	1.85-2.08
1,1,2,2-Tetrachloroethane	83	d_2-1,1,2,2-Tetrachloroethane	2.05-2.28
d_2-1,1,2,2-Tetrachloro-ethane	84		2.05-2.28
1,2-Dichlorobenzene	146	d_4-1,4-Dichlorobenzene	2.88-3.11
d_4-1,4-Dichlorobenzene	150		2.73-2.96
1,4-Dichlorobenzene	146	d_4-1,4-Dichlorobenzene	2.73-2.96
Xylene	106	d_{10}-p-Xylene	1.65-1.88
d_{10}-p-Xylene	116		1.65-1.88
Ethylphenol	122	d_{10}-Ethylbenzene	2.19-2.43

[a]Relative retention times calculated versus the internal quantitation standard, bromochloropropane.
[b]Designation indicates the pairing of the target analytes with the respective internal standards.

2. Quantitation

Data were quantitated based on either the internal standard or the isotope dilution principle. The isotope dilution principle applies to the quantitation of target analytes for which a deuterated analog was available as an internal standard. Where possible, the deuterated analog of a target analyte was used for quantitation. Other compounds' concentrations were calculated versus the internal standard, bromochloropropane (1-chloro-2-bromopropane).

The HRGC/MS data were quantitated using the following equation:

$$\text{Target analyte, } \mu g = \frac{A_S \times IS}{A_{IS} \times RRF}$$

where A_S = area of the characteristic quantitation ion of the target analyte,

A_{IS} = area of the characteristic quantitation ion of the internal standard,

IS = amount of the internal standard in micrograms (μg),

RRF = relative response factor of the target analyte versus the respective internal standard

The concentration (μg/g) of the target analyte in the original sample was calculated by dividing the total micrograms of target analyte detected by the composite weight. In this report concentration data are expressed in either micrograms per gram (μg/g) or nanograms per gram (ng/g).

The quantitative data were qualified based on the observed response for each target analyte and the corresponding internal standard. Compounds for which no positive response was observed are reported as not detected (ND). An estimated limit of detection (LOD) was calculated based on the observed instrumental response for the specific target analyte and corresponding internal standard in each sample. The LOD was estimated as the amount of a specific analyte that must be present to give rise to a signal at least 2.5 times the background signal-to-noise.

Compounds detected for which the observed response of the characteristic quantitation ion was greater than 2.5 times but less than 10 times the background signal-to-noise are reported as trace (tr) values. Target analytes detected at greater than 10 times the background signal-to-noise, limit of quantitation (LOQ), are reported as positive quantifiable values.

All data were corrected for blank values observed for the system blank run daily with each set of samples.

H. Method Validation

The analytical method was evaluated by analyzing adipose tissue specimens fortified with known levels of specific volatile organic compounds.

These experiments were designed to evaluate the use of the internal standards recommended for EPA Method 624 (USEPA 1984) for determination of volatile organics in water and wastewater (bromochloromethane, bromochloropropane, and 1,4-dichlorobutane), as well as multiple deuterated analogs of specific target analytes (isotope dilution). Preliminary studies demonstrated that the internal standards, bromochloromethane and 1,4-dichlorobutane, were not adequately recovered from the adipose tissue/water mixtures. Bromochloropropane provided reasonable response from the spiked adipose matrix and was further evaluated as a quantitation standard.

The results of the analysis of adipose tissue spiked with nine volatile compounds at four concentration levels ranging from 5 to 75 ng/g (ppb) are presented in Table 2. In general, the average recovery of the analyses for these compounds was good, except for chloroform, which demonstrated an average recovery of 264%. Although the average recovery for the other compounds was quite good (62 to 116%), wide variability was noted for the individual analyses at each spike level.

The high recovery of chloroform from this study may be a result of a difference in the background chloroform concentration in the adipose tissue used for this spiking experiment as compared to the tissue used for calibration. An absolute value for the background contribution of each target analyte was not determined from unspiked tissued used in these experiments. Another factor that may have resulted in the high recovery of chloroform is the possible conversion of trichloroacetic acid (present as a metabolite of tetrachlroethylene, trichloroethane, etc.). to chloroform at the elevated temperatures required to complete the analyses (Peoples, Pfaffenberger, Shafik, Enos 1979).

The impact of the use of multiple internal standards versus a single internal standard was evaluated as a separate experiment. Deuterated analogs of several target analytes were added to fortified tissue samples in addition to bromochloropropane. Table 3 presents the comparison of the single versus multiple internal standard quantitation techniques. As noted in Table 3, a deuterated analog was not available for tetrachloroethene. The data generated for the target analytes demonstrate average recoveries ranging from 82 to 136% for the multiple internal standard quantitation as compared to average recoveries of 74 to 143% for the same compounds quantitated versus bromochloropropane. The somewhat tighter range of recoveries or accuracies of quantitation with incorporation of the multiple internal standards results from the fact that the deuterated analogs behave similarly to the target analytes.

The purging efficiencies of the target analytes and the internal standards were evaluated from replicate analyses of a single fortified adipose tissue. This experiment was necessary to (1) demonstrate the difference in partitioning of the various target analytes from the water/tissue mixture to the headspace and (2) compare the partitioning characteristics of the available internal standards versus the target analytes. A 20-g aliquot of tissue was spiked with 1.0 μg each of the internal standards and 0.20 μg of the target analytes. The sample was heated to approximately 80°C, and the headspace above the stirred mixture was sampled for 40 min. The volatile compounds were desorbed from the Tenax adsorbent and analyzed by HRGC/MS. The heating, purging, sampling, and analysis procedures were repeated an additional three times.

Table 2. Summary of Spiked Recovery (%) Experiments for Volatile Compounds from 20 g of Human Adipose Tissue[a]

Compound	Level 1		Level 2		Level 3		Level 4		Average recovery (%)
	Spike (μg)	Measured (μg)	Spike (μg)	Measured (μg)	Spike (μg)	Measured (μg)	Spike (μg)	Measured (μg)	
Chloroform	1.5	2.71	0.1	0.65	0.6	1.10	0.5	0.64	280 ± 240
Benzene	1.5	1.60	0.1	0.16	0.6	0.60	0.5	0.47	120 ± 33
Bromochloromethane	1.5	1.48	0.1	0.044	0.6	0.51	0.5	0.37	75 ± 23
Toluene	1.5	0.80	0.1	0.14	0.6	0.37	0.5	0.33	80 ± 40
Tetrachloroethene	1.5	0.39	0.1	0.14	0.6	0.25	0.5	0.20	62 ± 53
Chlorobenzene	1.5	1.39	0.1	0.09	0.6	0.54	0.5	0.53	95 ± 8
Ethylbenzene	1.5	1.15	0.1	0.10	0.6	0.48	0.5	0.51	90 ± 13
Tetrachloroethane	1.5	1.21	0.1	0.15	0.6	0.49	0.5	0.52	104 ± 32
Dichlorobenzene	1.5	1.27	0.1	0.10	0.6	0.50	0.5	0.54	94 ± 12

[a]Spiking solutions were prepared as a blind QC effort by the MRI quality control coordinator. All calculations were based on the internal standard, bromochloropropane. The spike levels were equivalent to 5-75 ng/g (ppb) in 20 g of adipose tissue.

Table 3. Summary of Spiked Recovery (%) Experiments Based on a Single Internal Standard Bromochloropropane versus Multiple Deuterated Standards (Isotope Dilution)

Compound	Single internal standard				Multiple deuterated standard[a]			
	0.2 μg	0.6 μg	1.5 μg	Average recovery (%)	0.2 μg	0.6 μg	1.5 μg	Average recovery (%)
Chloroform	110	77	53	80 ± 29	160	81	111	117 ± 40
Benzene	105	80	68	84 ± 19	116	94	90	101 ± 15
Toluene	100	54	67	74 ± 24	114	57	76	82 ± 29
Tetrachloroethene	85	59	39	61 ± 23	-	-	-	-
Chlorobenzene	118	128	122	123 ± 5	120	121	119	120 ± 1
Ethylbenzene	103	113	116	110 ± 7	117	111	98	109 ± 10
Tetrachloroethane	103	107	97	102 ± 5	105	102	90	99 ± 8
Dichlorobenzene	105	155	170	143 ± 34	125	137	146	136 ± 11

[a]Deuterated analogs of each of the compounds were spiked as internal standards for all but tetrachloroethene, for which a stable isotope-labeled internal standard was not available.

The absolute area counts for the characteristic quantitation ion for each compound were recorded. The data for each compound monitored are provided in Figures 3 to 6 and are plotted as absolute area counts versus the sample run number.

Figure 3 is a plot of the three internal standards used in EPA Method 624 for volatiles in water and wastewater. Three distinctive plots for the three internal standards are presented. These data demonstrate that bromochloromethane is not an acceptable internal standard due to low response. The breakthrough volume for the volatile components is based on the total sample volume mass of adsorbent and sampling temperature. Based on sampling volumes extrapolated by Brown and Purnell (1977), it is expected that the optimum sampling volume for the more volatile components, such as bromochloromethane, are approximately 9 to 10 L per gram of Tenax adsorbed. The total sample volume used in these experiments was 1.6 L (40 mL/min for 40 min) and the total mass of Tenax was approximately 0.2 g. Hence, the low response observed for bromochloromethane is probably due to the low capacity of the Tenax adsorbent system for the more volatile compounds rather than to the purging efficiency from the matrix.

The plot of bromochloropropane indicates that this internal standard is effectively partitioned from the adipose/water mixture to air for all four analyses. The plot for 1,4-dichlorobutane, on the other hand, indicates that this compound is fairly soluble in the adipose/water matrix. The adipose/air partitioning constant is obviously low. Hence, this compound was not considered as a quantitative internal standard for further sample analyses.

Figure 4 presents additional plots of the observed purging efficiencies for eight deuterated internal standards spiked initially at 1.0 μg in the 20-g adipose tissue sample. Again it is noted that the deuterated analog of chloroform was detected only in the first sample analysis. This observation is possibly due to the fact that chloroform has the lowest boiling point (b.p. 60.5-61.5°C), hence greatest volatility, of the compounds analyzed. Deuterated methylene chloride (d_2-CH_2Cl_2) was also added to these samples but was not detected even in the first analyses. The plots of the other internal standards appear to reflect the effect of boiling point on purging efficiency from the heated mixture. The d_6-benzene and d_8-toluene demonstrate the most significant differences in absolute response for the sequential analysis of the spiked adipose sample. The boiling points for these compounds range from approximately 80 to 111°C as compared to 135 to 173°C for d_{10}-p-xylene and d_4-1,4-dichlorobenzene.

The absolute responses of several target analytes spiked (0.20 μg each) into the same 20-g aliquot of human adipose are plotted for the four sequential analyses (Figures 5 and 6). The plots for these target analytes also appear to correspond with the boiling points of the specific compound. The more volatile compounds such as chloroform (b.p. 60.5-61.5°C), 1,1,1-trichloroethane (b.p. 74-76°C), and dibromochloromethane (b.p. 119-120°C) were detected in only the first and second analyses, indicating better purging efficiency, although less retention on the Tenax adsorbent, than demonstrated for the other compounds. The response profiles noted for compounds such as benzene, toluene, chlorobenzene, tetrachloroethene, ethylbenzene, and dichlorobenzene are very similar to the plots of the deuterated analogs presented in Figure 4.

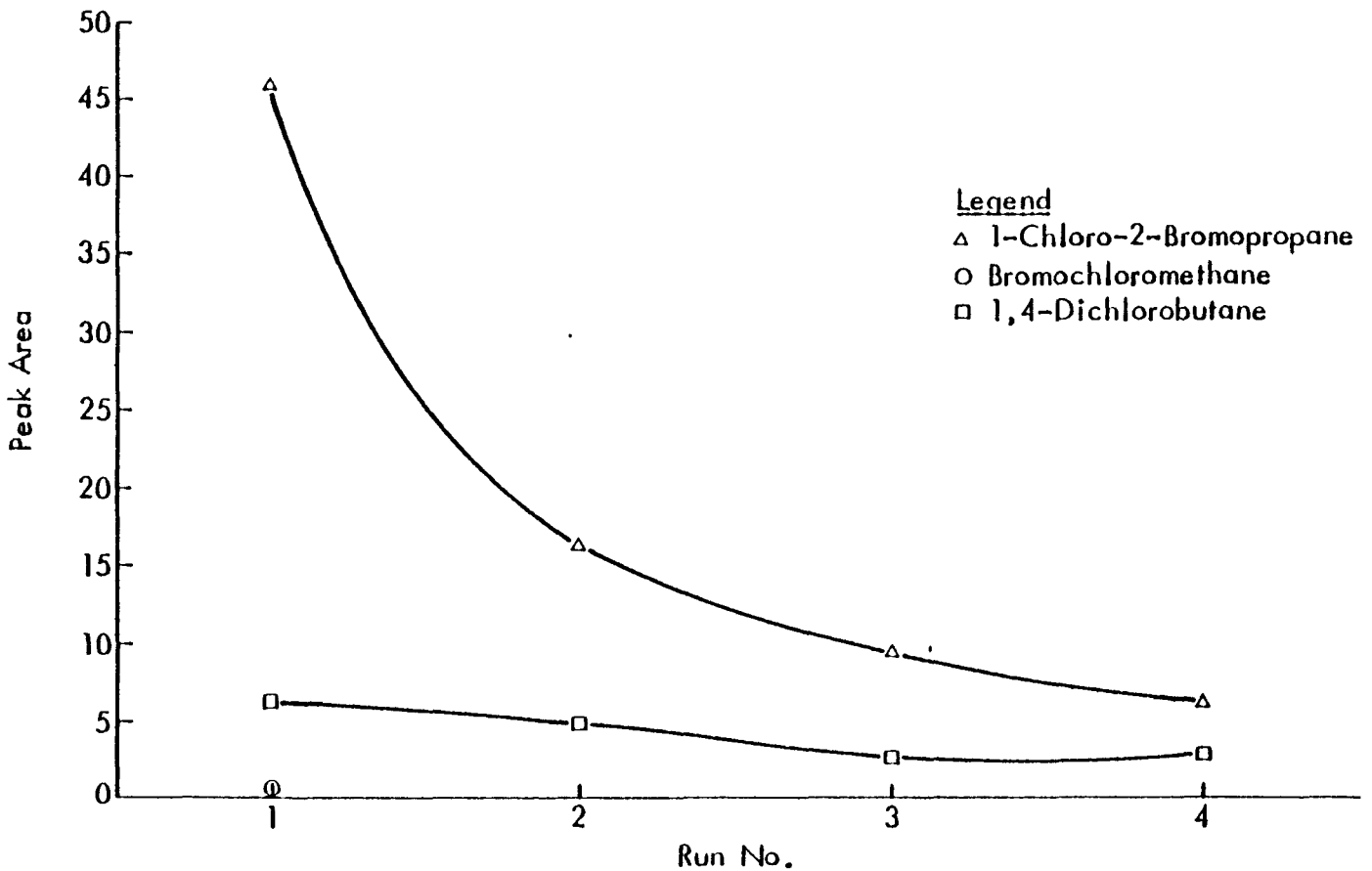


Figure 3. Purging efficiency of three internal standards (1 μg each) from 20 g of human adipose tissue, over four sequential, 40-min heating and purging cycles.

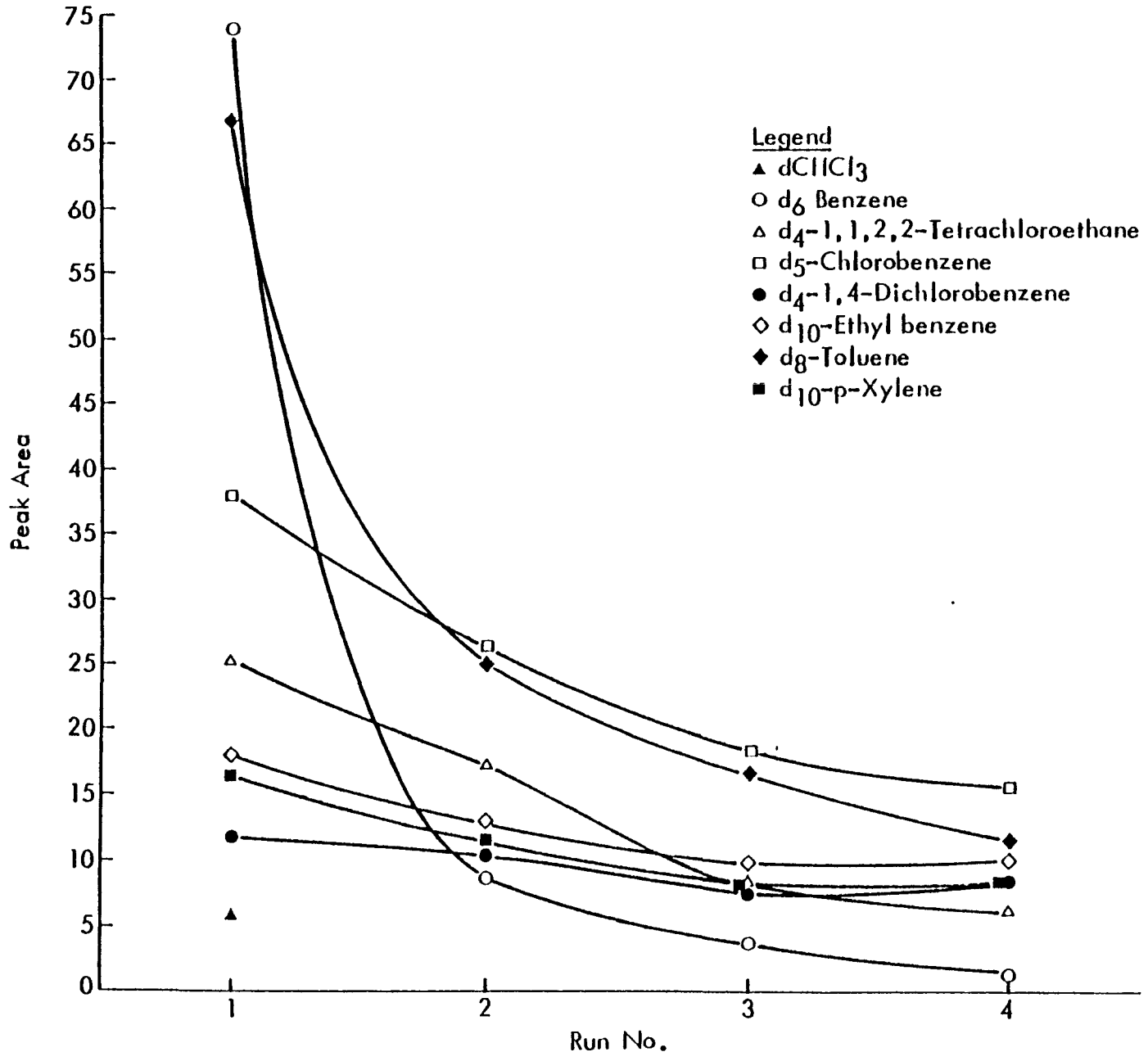


Figure 4. Purging efficiency of eight internal standards (1 μg each) from 20 g of human adipose tissue over four sequential 40-min heating and purging cycles.

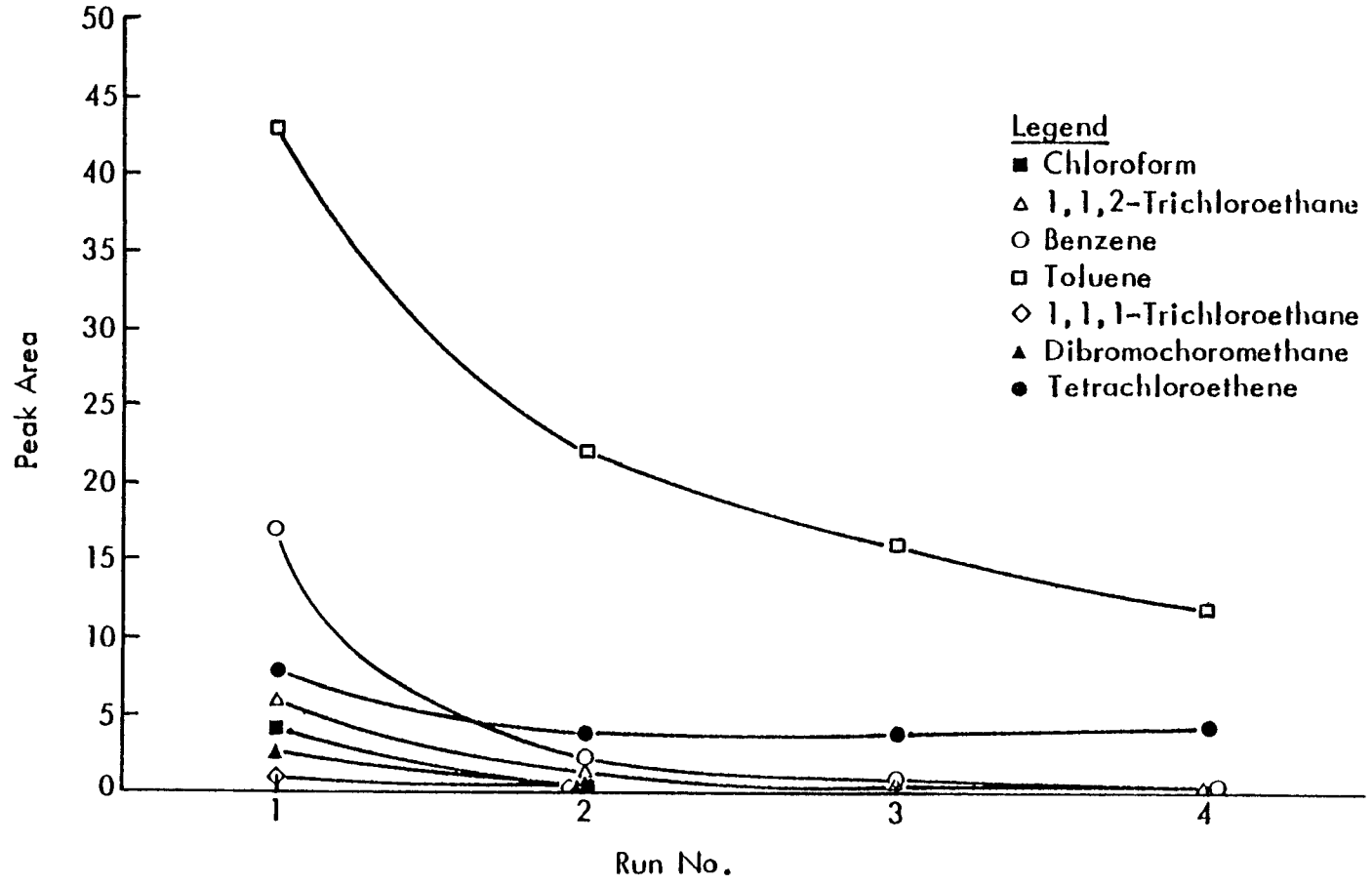


Figure 5. Purging efficiency of seven target analytes (0.20 μg each) spiked into 20 g of human adipose tissue, over four sequential, 40-min heating and purging cycles.

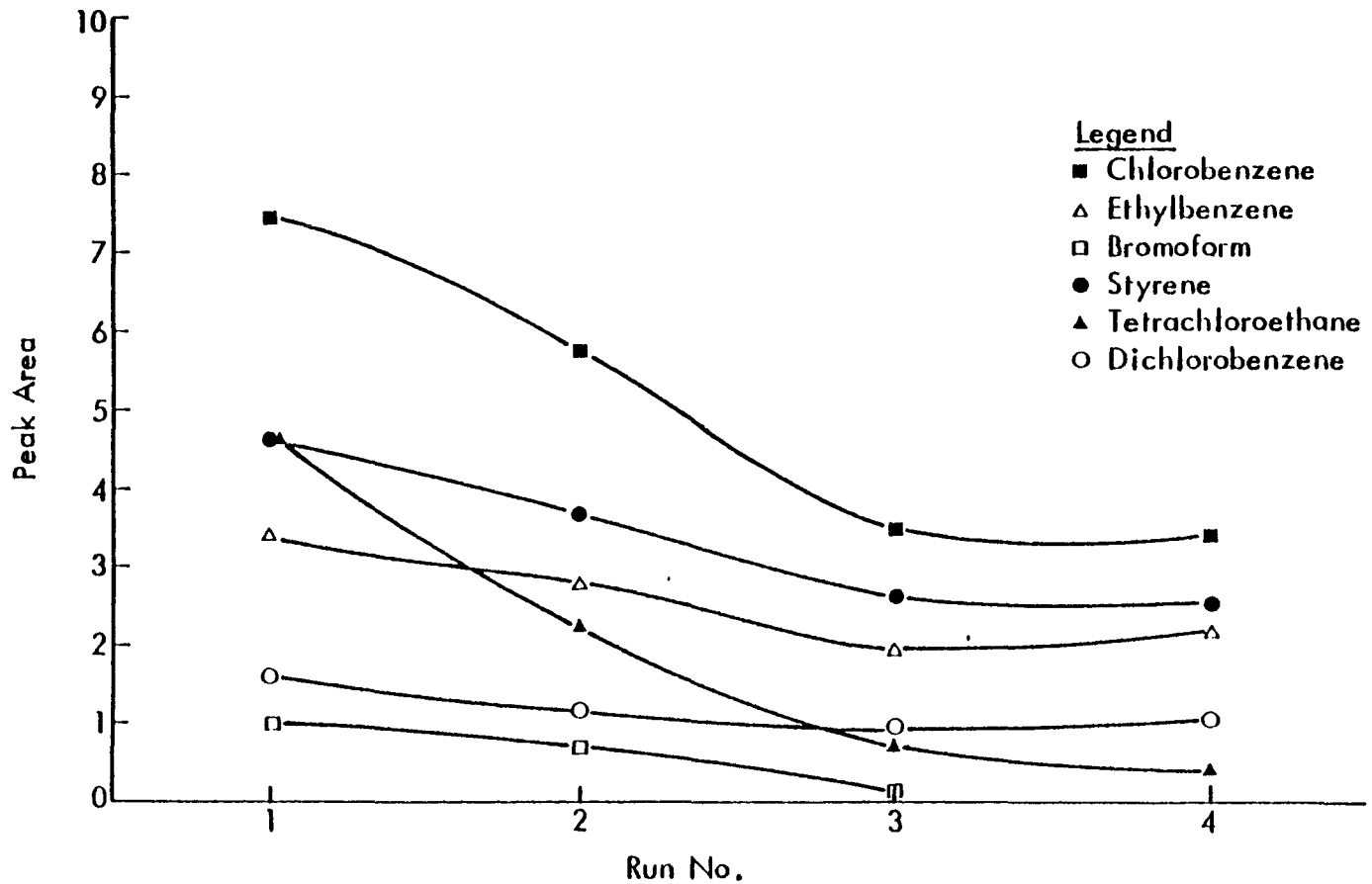


Figure 6. Purging efficiency of six target analytes (0.20 μg each) spiked into 20 g of human adipose tissue, over four sequential, 40-min heating and purging cycles.

The similarity in the response profiles for several target analytes and the corresponding deuterated analogs are presented in Figures 7 to 9. These plots reflect that the purging efficiencies of each pair of compounds are equivalent from the spiked adipose tissue. These plots demonstrate the advantages of the isotope dilution (target analyte/deuterated internal standard pair) technique versus a single internal standard for quantitation of volatile organics in human adipose tissue. With the exception of toluene, the differences of responses noted for these pairs are roughly a factor of 5 for each analysis, which corresponds to the spike ratio of 0.20 μg of target analyte versus 1.0 μg for the deuterated internal standard. The difference noted for the toluene/d_8-toluene plot is the result of the endogenous toluene concentration in the tissue sample used for these analyses.

Figure 10 provides a plot of the observed responses for several compounds not spiked into the tissue sample. These compounds include 1,4-dichlorobenzene, two xylene isomers, and three C_3-alkyl benzenes (trimethyl, methylethyl, or propyl isomers). These results indicate that the method might be capable of detecting and quantitating compounds with boiling points ranging up to approximately 175°C.

IV. RESULTS

The analyses for the NHATS FY82 composite samples were completed following the method evaluation studies. Figures 11 to 17 provide examples of the HRGC/MS chromatograms for the analysis of instrument performance checks, spiked tissue samples, and actual composite samples.

Figures 12 and 13 compare the HRGC/MS chromatogram of the bulk adipose tissue used to establish method performance and one of the composite samples. The HRGC/MS chromatogram of the composite sample appears to have considerably more volatile material than the bulk adipose used to prepare the tissue standard. Tentative identifications for some of the major peaks in Figure 13 were assigned based on the comparison of the mass spectra to library spectra.

Figures 14 and 15 provide comparisons of the composite specimens for three age groups within the same census division. All of the samples from each census division were analyzed on the same day. The results demonstrate that the elution profiles of all samples are comparable although the absolute responses of the peaks vary.

Figures 16 and 17 provide comparisons of three composite samples representing the 15-44 and 0-14 age groups from three census divisions. Again the general HRGC/MS profiles appear to be consistent although the absolute response of each peak varies from sample to sample.

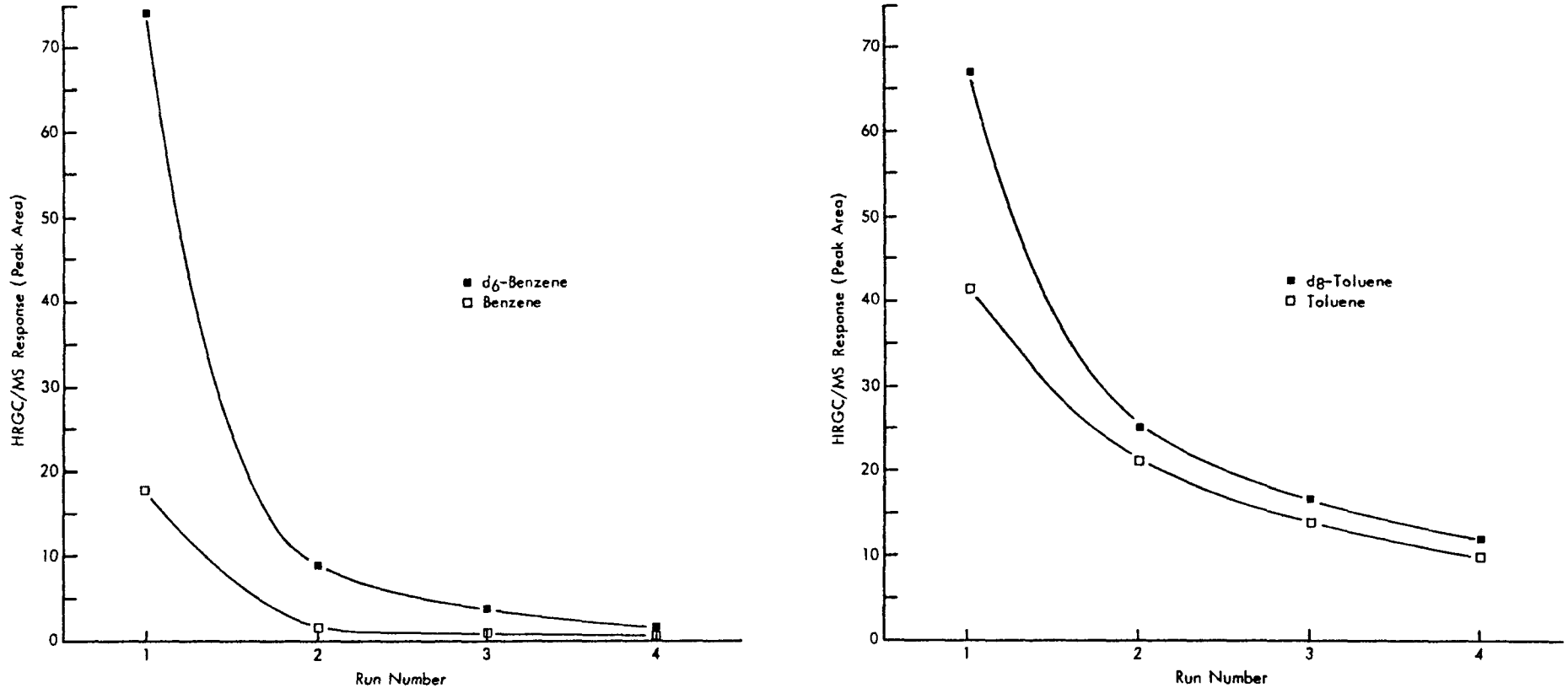


Figure 7. Comparison of purging efficiencies for target analyte/deuterated analog pairs: (a) benzene/d_6-benzene and (b) toluene/d_8-toluene.

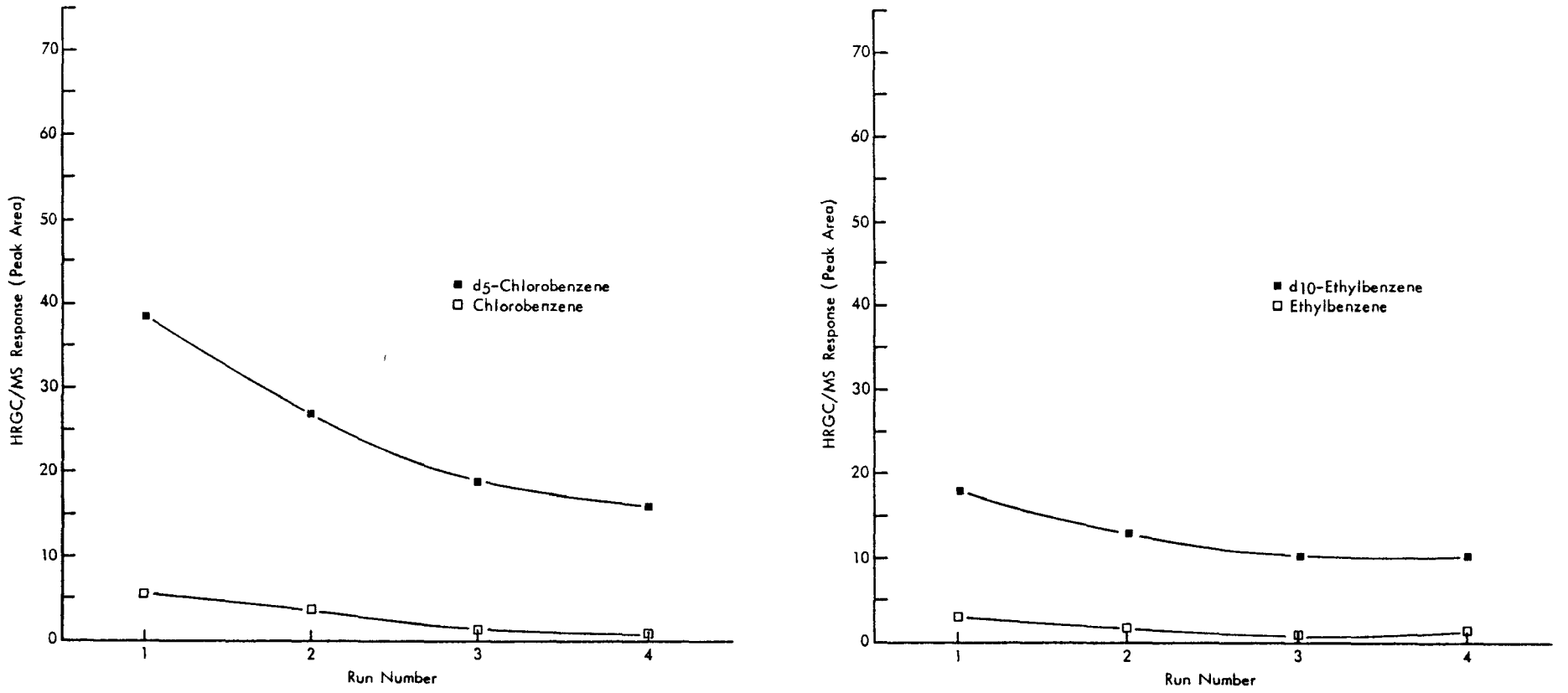


Figure 8. Comparison of purging efficiencies for target analyte/deuterated analog pairs: (a) chlorobenzene/d_5-chlorobenzene and (b) ethylbenzene/d_{10}-ethylbenzene.

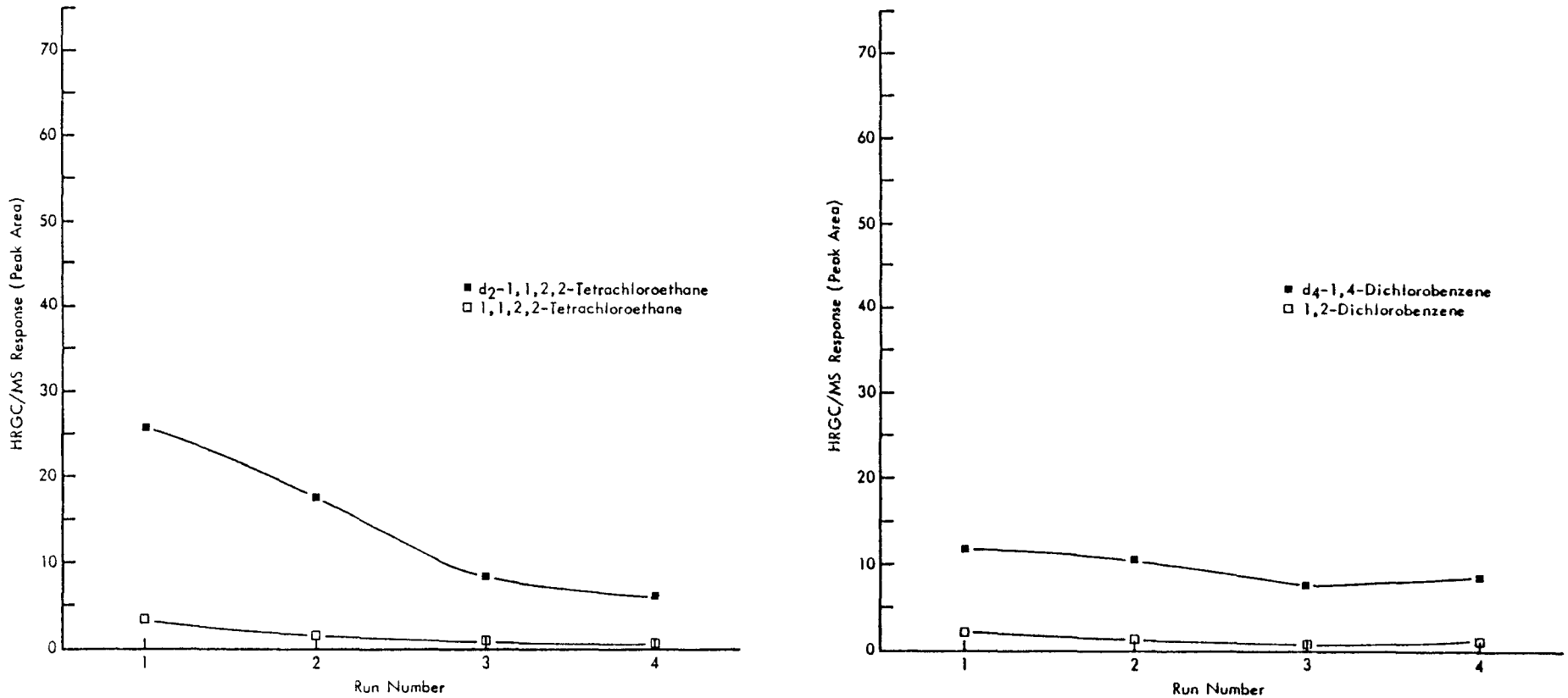


Figure 9. Comparison of purging efficiencies for target analyte/deuterated analog pairs for (a) 1,1,2,2-tetrachloroethane/d_2-1,1,2,2-tetrachloroethane and (b) 1,2-dichlorobenzene/d_4-1,4-dichlorobenzene.

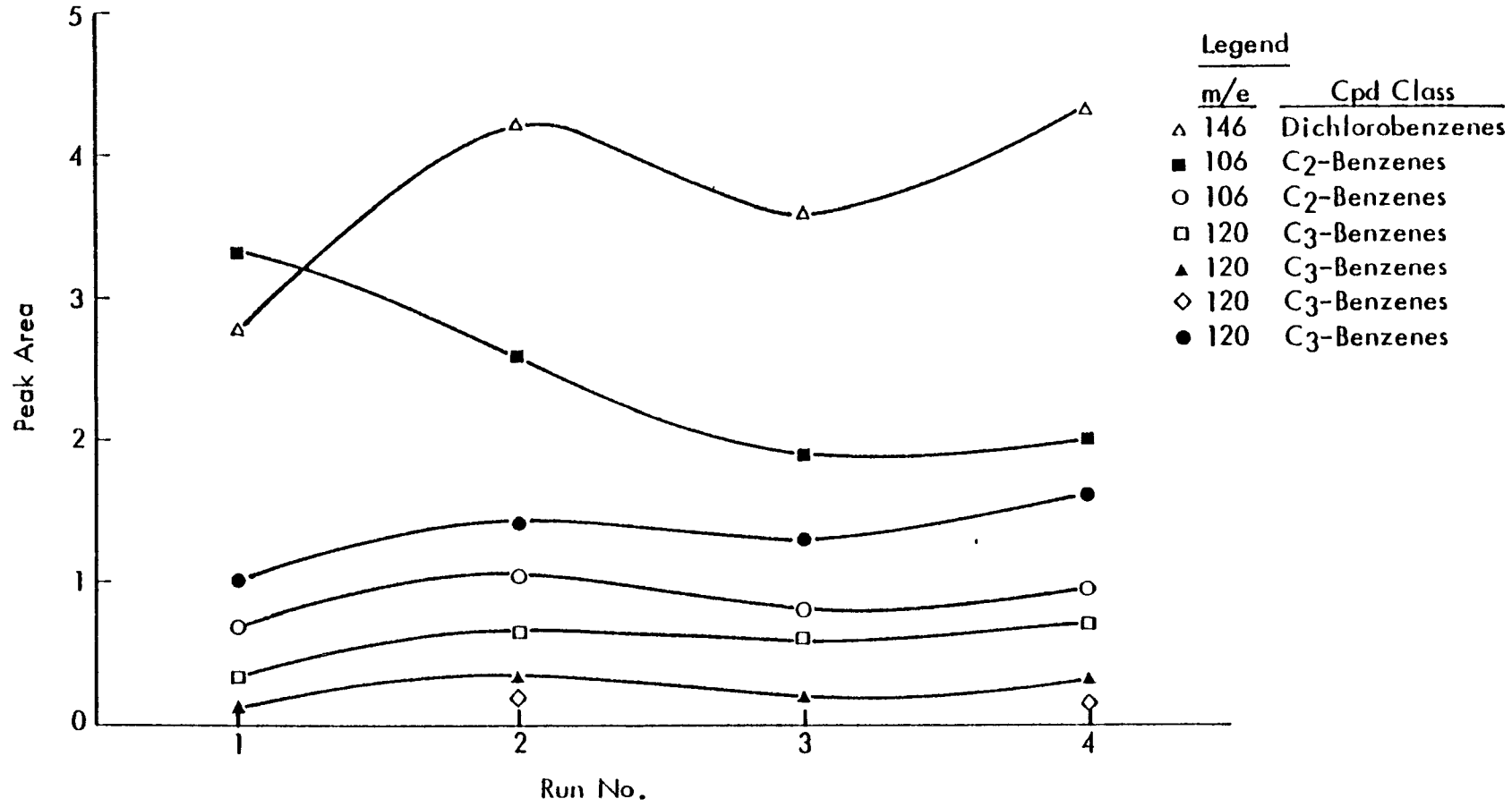


Figure 10. Purging efficiency of seven volatile organic analytes endogenous to human adipose tissue over four sequential 40-min heating and purging cycles.

1. Benzene/d_6-benzene
2. Bromodichloromethane
3. Toluene/d_8-toluene
4. Bromochloropropane/ 1,1,2-trichloroethane
5. Dibromochloromethane
6. Tetrachloroethene
7. Chlorobenzene/ d_5-chlorobenzene
8. d_{10}-ethylbenzene
9. Ethylbenzene
10. d_{10}-p-xylene
11. Bromoform
12. Styrene
13. Dichlorobutane
14. 1,1,2,2-tetrachloroethane
15. d_4-1,4-dichlorobenzene
16. 1,2-dichlorobenzene

Purge Tower Standard

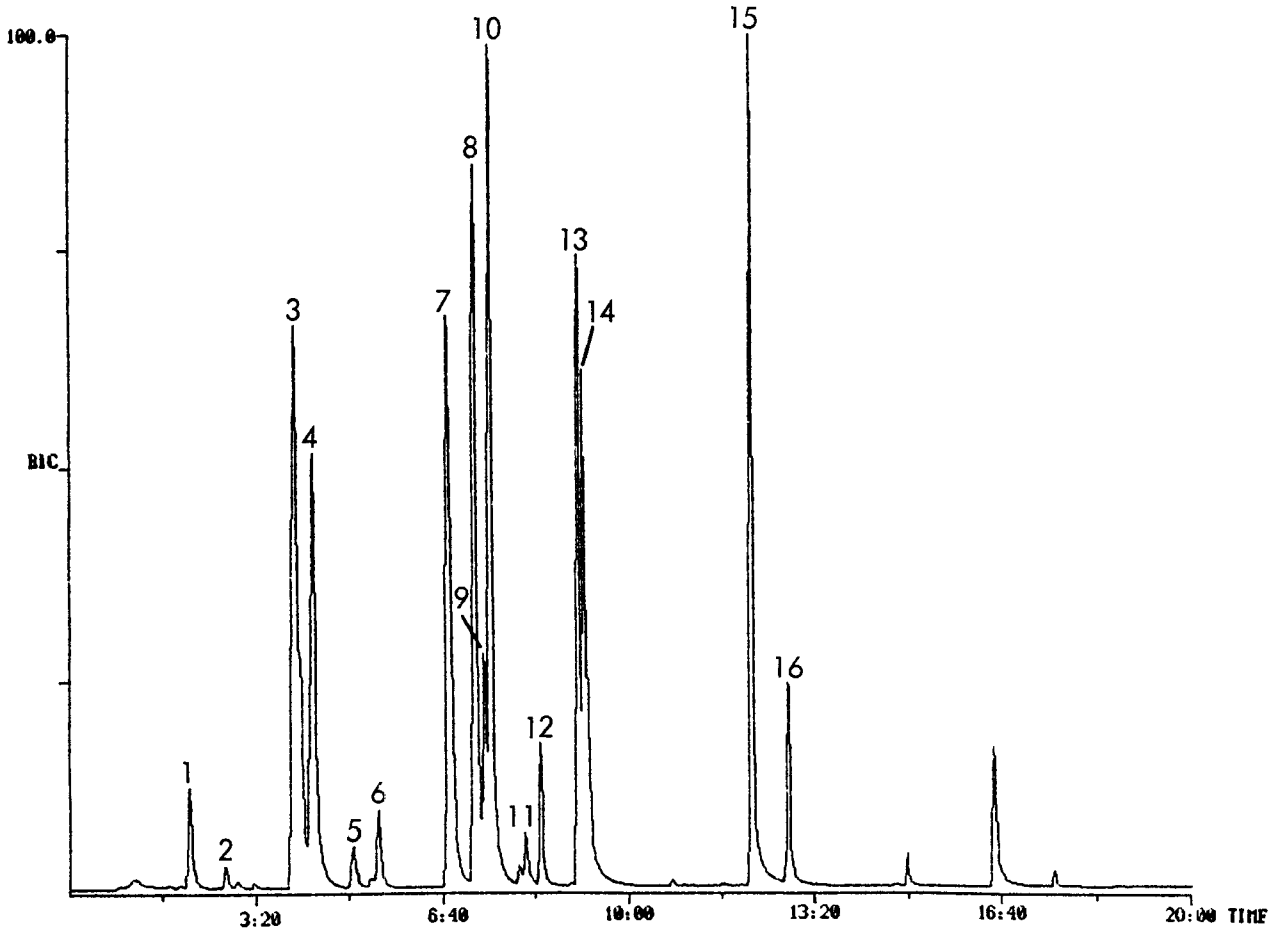


Figure 11. HRGC/MS chromatogram of purge tower standard analyzed daily to document instrument performance.

1. Chloroform/d-chloroform
2. Bromochloromethane
3. 1,1,1-trichloroethane
4. Benzene/d_6-benzene
5. Bromodichloromethane
6. Toluene/d_8-toluene
7. 1,1,2-trichloroethane
8. Dibromochloromethane
9. Tetrachloroethene
10. Chlorobenzene/ d_5-chlorobenzene
11. d_{10}-ethylbenzene
12. Ethylbenzene
13. d_{10}-p-xylene
14. Bromoform
15. Styrene
16. 1,1,2,2-tetrachloroethane/ d_2-1,1,2,2-tetrachloroethane
17. d_4-1,4-dichlorobenzene
18. 1,2-dichlorobenzene

Tissue Standard

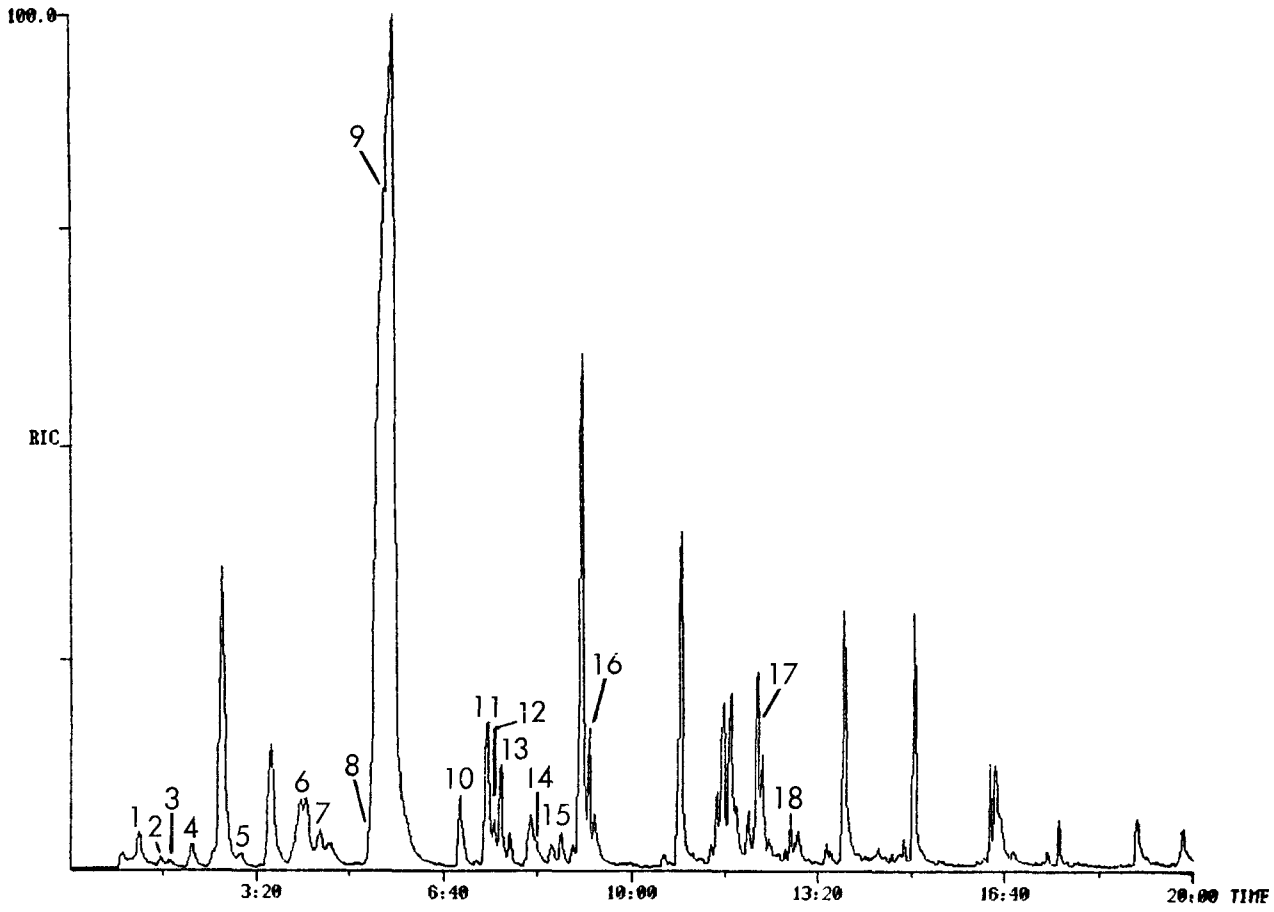


Figure 12. HRGC/MS chromatogram for the volatile organic analysis of a bulk adipose (tissue standard) spiked with 1.0 μg of each internal standard and 0.20 μg of each target analyte.

Tentative Identification
of Major Peaks

1. Acetic acid ethyl ester/
   Propanoic acid propyl ester
2. Heptanal
3. Decane
4. Dimethyloctane
5. Trimethylcyclohexane
6. Nonanal
7. Undecene
8. Ethyl ester, carboxylic acid
9. Nonadienal

Middle Atlantic, 0-14 years

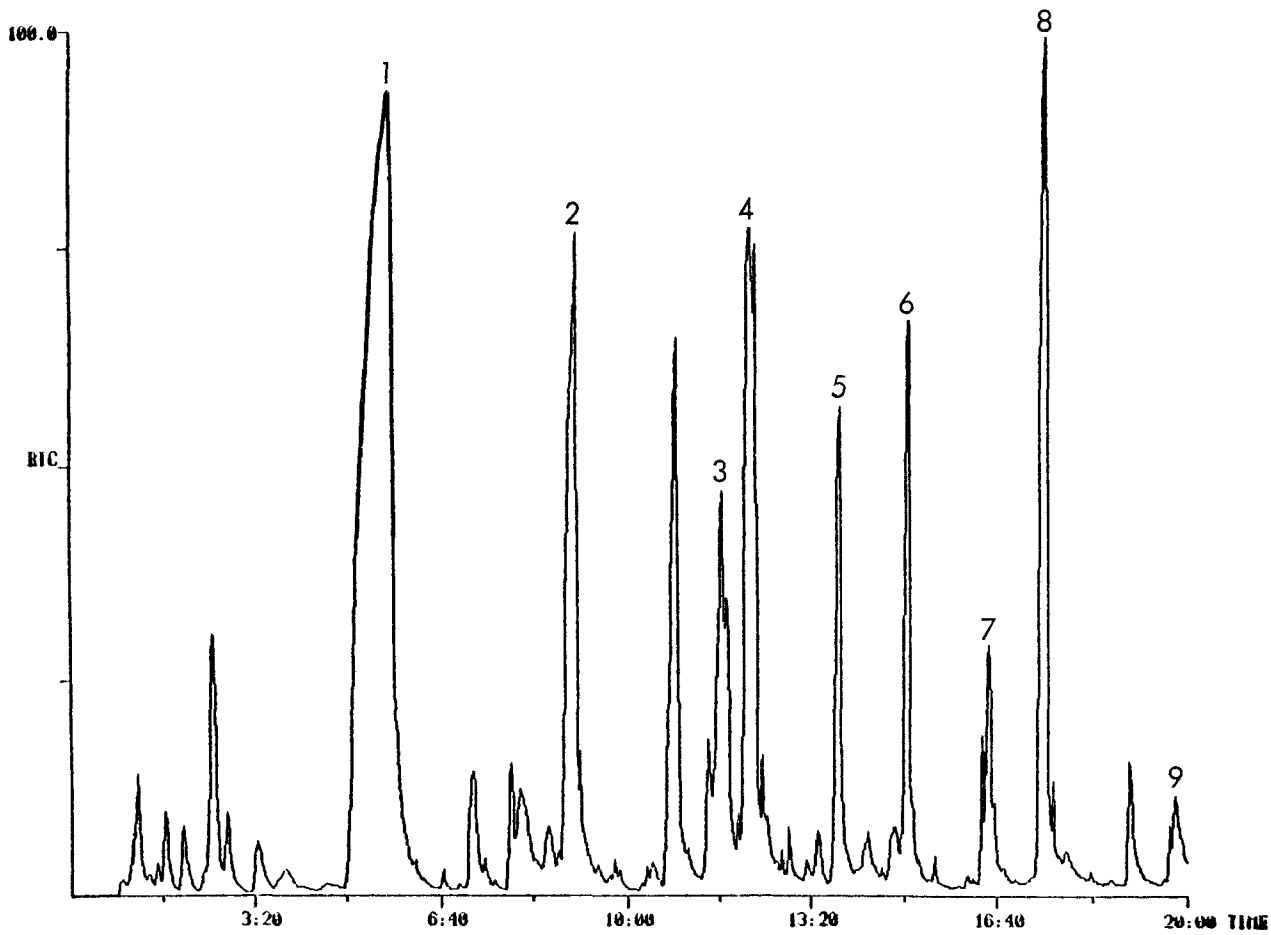


Figure 13. HRGC/MS chromatogram of volatile compounds from the NHATS FY82 composite of the 0-14 year age group from the Middle Atlantic census division.

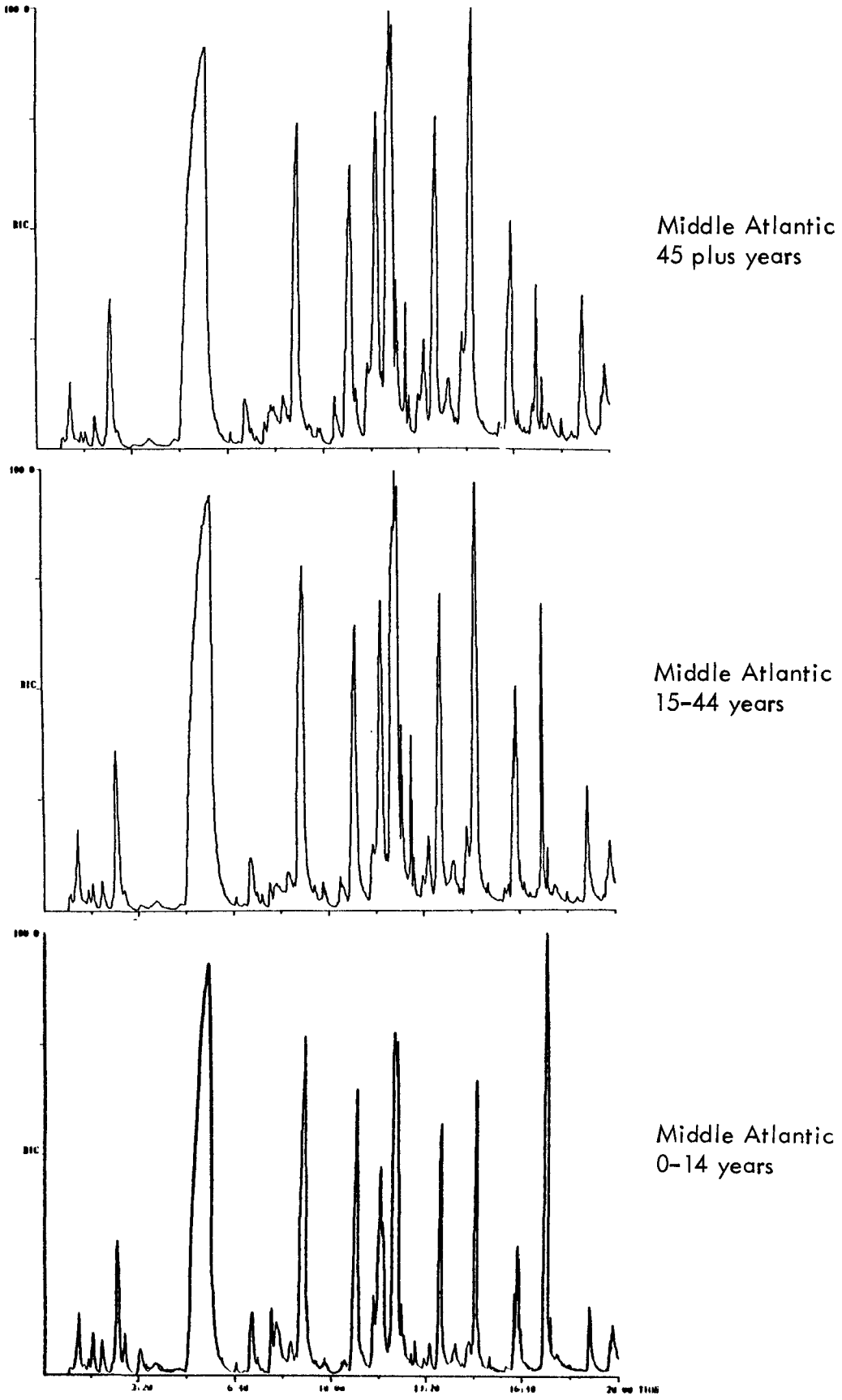


Figure 14. Comparison of the HRGC/MS chromatograms for the volatile organic analytes for three composite age groups from the Middle Atlantic census division.

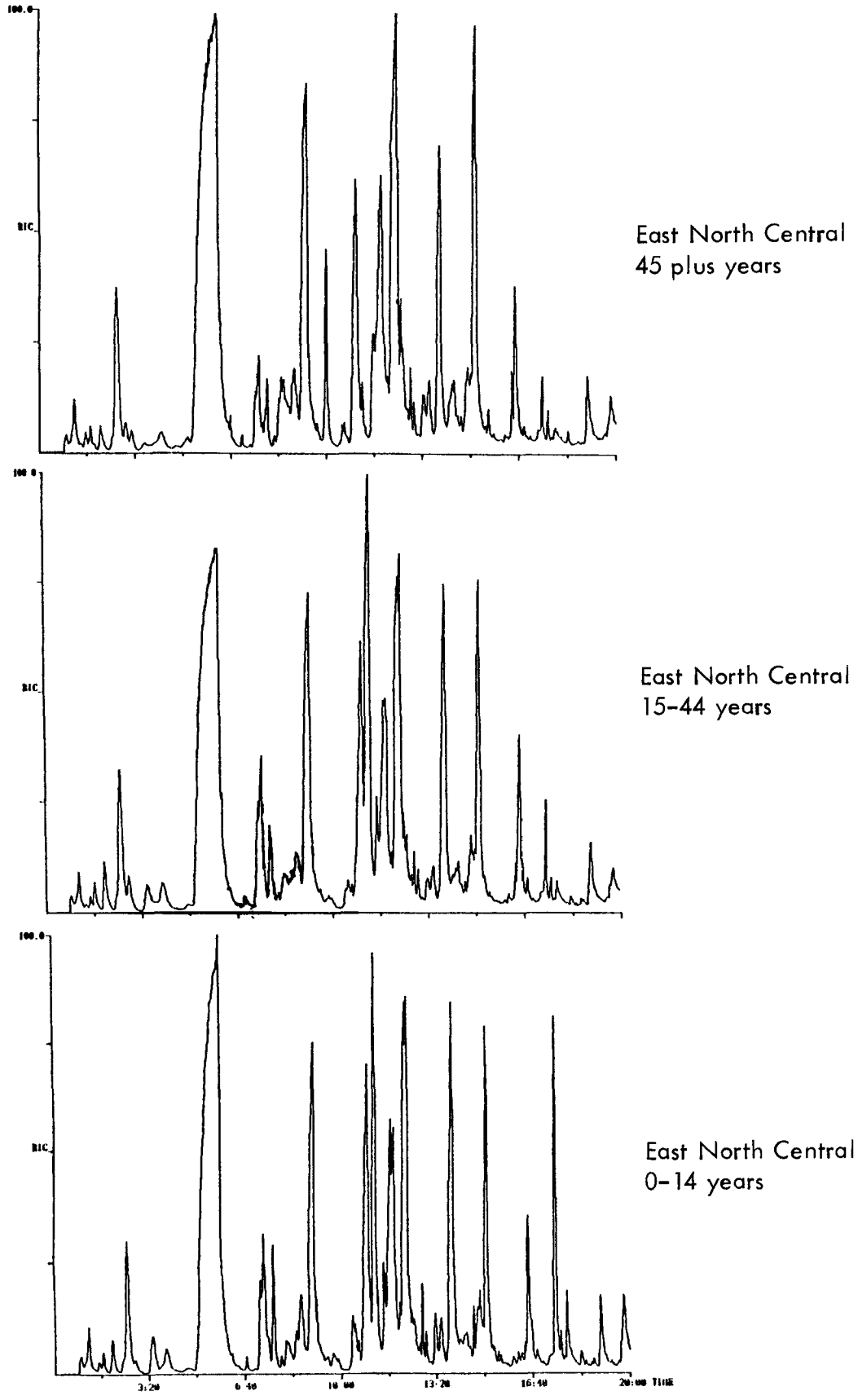


Figure 15. Comparison of the HRGC/MS chromatograms for the volatile organic analytes for three composite age groups from the East North Central census division.

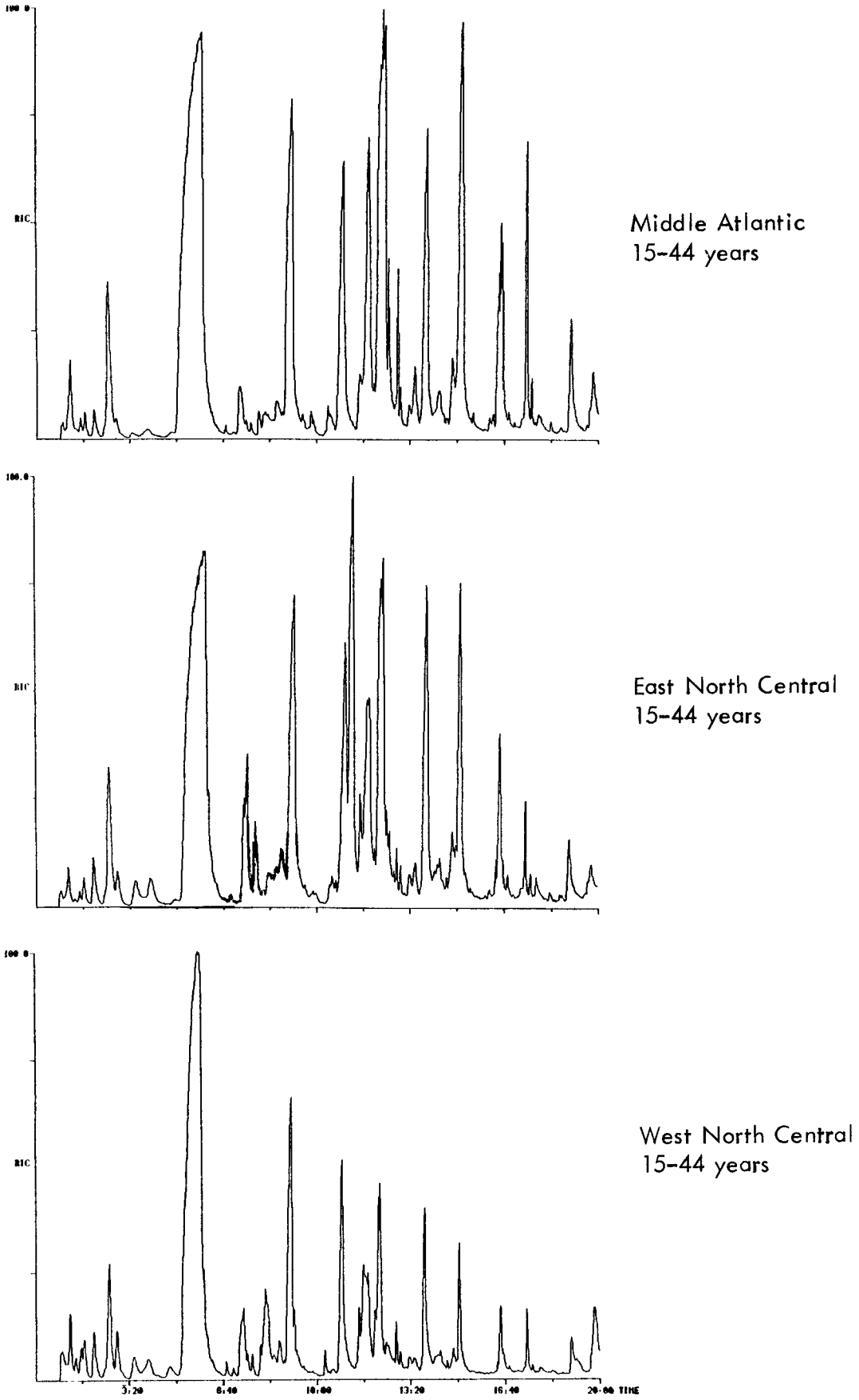


Figure 16. Comparison of the HRGC/MS chromatograms of the volatile organic analysis of three composite specimens representing the 15-44 age group from three census divisions.

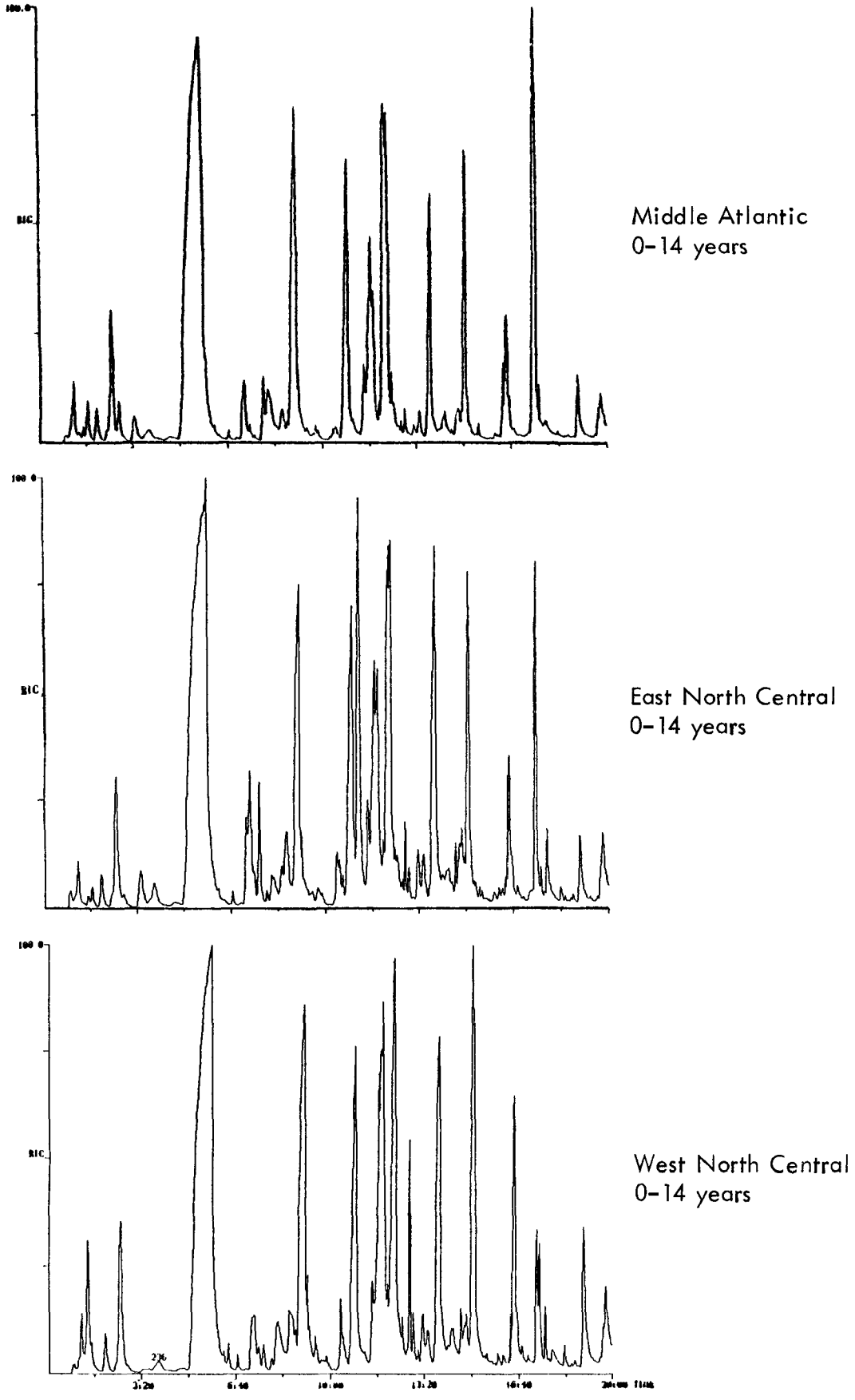


Figure 17. Comparison of the HRGC/MS chromatograms of the volatile organic analysis of three composite specimens representing the 0-14 age group from three census divisions.

Seventeen target analytes were determined using the automated HRGC/MS search routines and the mass spectral library established in the method evaluation studies. Figures 18 to 21 summarize the incidence of detection of each of these analytes by age and by census division within the four regions. A plus indicates that the compound was detected in the analysis of a particular composite. A minus indicates the compound was not detected above the estimated limit of detection. The number of symbols shown under each age category for a specific compound indicates the total number of composites analyzed.

The quantitative data for the 17 target analytes are shown in Tables 4 through 20 by census division and age group. The tables provide the total wet tissue weight composited, the total mass of the specific analyte detected, the concentration based on the original wet tissue weight, and the analysis date. The tables provide estimated limits of detection for composites for which a compound was not detected (ND) and for composites for which the compound is reported as a trace (tr) value. Trace values are reported for responses observed at greater than 2.5 times the signal-to-noise but less than 10 times signal-to-noise. Data reported with no qualifier indicate a positive response detected above the limit of quantitation (LOQ) or greater than 10 times the background signal-to-noise.

Upon reviewing the data in Tables 4 through 20 reported as not detected (ND), it is noted that the level of detection (total micrograms) varies from one sample to another. This results from a combination of the observed background in a sample at the characteristic ion for a specific analyte and the intensity of the response of the characteristic ion for the corresponding internal standards. Hence, the calculated limits of detection were higher in some instances due to high background at the charasteric ions for the target analytes and/or low recovery (observed as intensity of repsonse) of the associated internal standards.

Table 21 presents the frequency of observation of the target analytes from the 46 composite samples. Styrene, 1,4-dichlorobenzene, xylene isomers, and ethylphenol were detected in all 46 composites. Two responses were observed that corresponded to xylene isomers. However, the isomers are not specified since the order of elution of the three possible compounds was not determined. Benzene, chlorobenzene, ethylbenzene, and toluene were detected in nearly all composites. Tetrachloroethane, 1,2-dichlorobenzene, and 1,1,1-trichloroethane were detected in approximately 50 to 60% of all composite specimens. 1,1,2,2-Tetrachloroethane was detected in less than 10% of all composite samples (4 of the 46). The three brominated target analytes and 1,1,2-trichloroethane were not detected in any of the composite specimens.

The quantitative data for all compounds detected in a specific composite are reported in Tables B-1 to B-18 in Appendix B.

Census Region	Northeast					
Census division:	New England			Middle Atlantic		
Age group:	0-14	15-44	45+	0-14	15-44	45+
Compound						
Chloroform	+	+	+	+-	++	++
1,1,1-Trichloroethane	-	+	-	--	++	--
Bromodichloromethane	-	-	-	--	--	--
Benzene	+	+	+	++	++	++
Tetrachloroethene	-	-	-	++	++	++
Dibromochloromethane	-	-	-	--	--	--
1,1,2-Trichloroethane	-	-	-	--	--	--
Toluene	+	+	+	++	++	++
Chlorobenzene	+	+	+	++	++	++
Ethylbenzene	+	+	+	++	++	++
Bromoform	-	-	-	--	--	--
Styrene	+	+	+	++	++	++
1,1,2,2-Tetrachloroethane	-	-	-	--	--	--
1,2-Dichlorobenzene	+	+	-	++	++	++
1,4-Dichlorobenzene	+	+	+	++	++	++
Xylene[a]	+	+	+	++	++	++
Ethylphenol	+	+	+	++	++	++

[a]The exact isomers were not determined.

Figure 18. Incidence of detection of volatile organic compounds in composited human adipose tissues from the Northeast census region. The total number of + and - symbols for a specific compound indicates the number of composites analyzed for each age group.

Census Region	South								
Census division:	South Atlantic			East South Central			West South Central		
Age group:	0-14	15-44	45+	0-14	15-44	45+	0-14	15-44	45+
Compound									
Chloroform	++	+++-	+++-	-	-+	--	-	++	-
1,1,1-Trichloroethane	-+	+++-	+++-	+	-+	-+	+	-+	-
Bromodichloromethane	--	----	----	-	--	--	-	--	-
Benzene	++	++++	++++	+	++	++	-	++	+
Tetrachloroethene	--	++++	-++-	-	++	-+	-	-+	-
Dibromochloromethane	--	----	----	-	--	--	-	--	-
1,1,2-Trichloroethane	--	----	----	-	--	--	-	--	-
Toluene	+-	++++	+++-	+	++	++	+	-+	+
Chlorobenzene	++	++++	-++-	+	++	++	+	++	+
Ethylbenzene	++	++++	++++	-	++	++	+	++	+
Bromoform	--	----	----	-	--	--	-	--	-
Styrene	++	++++	++++	+	++	++	+	++	+
1,1,2,2-Tetrachloroethane	--	----	---+	-	-+	++	-	+-	+
1,2-Dichlorobenzene	-+	-+--	----	+	-+	++	-	+-	+
1,4-Dichlorobenzene	++	++++	++++	+	++	++	+	++	+
Xylene[a]	++	++++	++++	+	++	++	+	++	+
Ethylphenol	++	++++	++++	+	++	++	+	++	+

[a]The exact isomers were not determined.

Figure 19. Incidence of detection of volatile organic compounds in composited human adipose tissues from the South census region. The total number of + and - symbols for a specific compound indicates the number of composites analyzed for each age group.

Census Region	Northcentral					
Census division:	East North Central			West North Central		
Age group:	0-14	15-44	45+	0-14	15-44	45+
Compound						
Chloroform	++	+++	+++	-	+	+
1,1,1-Trichloroethane	--	-+-	--+	-	-	-+
Bromodichloromethane	--	--	---	-	-	--
Benzene	++	+++	++-	+	+	++
Tetrachloroethene	+-	-++	-++	+	+	++
Dibromochloromethane	--	---	---	-	-	--
1,1,2-Trichloroethane	--	---	---	-	-	--
Toluene	++	+++	+++	+	+	++
Chlorobenzene	++	+++	+++	+	+	++
Ethylbenzene	++	+++	+++	+	+	++
Bromoform	--	---	---	-	-	--
Styrene	++	+++	+++	+	+	++
1,1,2,2-Tetrachloroethane	--	+--	---	-	-	--
1,2-Dichlorobenzene	++	++-	+-+	+	-	+-
1,4-Dichlorobenzene	++	+++	+++	+	+	++
Xylene[a]	++	+++	+++	+	+	++
Ethylphenol	++	+++	+++	+	+	++

[a]The exact isomers were not determined.

Figure 20. Incidence of detection of volatile organic compounds in composited human adipose tissues from the North Central census region. The total number of + and - symbols for a specific compound indicates the number of composites analyzed for each age group.

Census Region	West					
Census division:	Mountain			Pacific		
Age group:	0-14	15-44	45+	0-14	15-44	45+
Compound						
Chloroform	+	+	+	+	+	+
1,1,1-Trichloroethane	-	+	+	+	+	-
Bromodichloromethane	-	-	-	-	-	-
Benzene	+	+	+	+	+	+
Tetrachloroethene	-	-	+	-	+	+
Dibromochloromethane	-	-	-	-	-	-
1,1,2-Trichloroethane	-	-	-	-	-	-
Toluene	+	+	+	+	+	+
Chlorobenzene	+	+	+	+	+	+
Ethylbenzene	+	+	+	+	+	+
Bromoform	-	-	-	-	-	-
Styrene	+	+	+	+	+	+
1,1,2,2-Tetrachloroethane	-	-	-	-	-	-
1,2-Dichlorobenzene	-	+	+	+	+	+
1,4-Dichlorobenzene	+	+	+	+	+	+
Xylene[a]	+	+	+	+	+	+
Ethylphenol	+	+	+	+	+	+

[a]The exact isomers were not determined.

Figure 21. Incidence of detection of volatile organic compounds in composited human adipose tissues from the West census region. The total number of + and - symbols for a specific compound indicates the number of composites analyzed for each age group.

Table 4. Data Report - Chloroform (CAS No. 67-66-3) - FY82 Composite Adipose Tissue Samples

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-MO-VO-0-14	82-325	5.1	0.21	0.041	7/11/84
1-MO-VO-15-44	82-326	18.8	1.5	0.082	7/12/84
1-MO-VO-45+	82-327	22.4	2.8	0.12	7/12/84
1-NE-VO-0-14	82-304	20.0	Tr, 0.070 (0.020)[c]	Tr, 0.0035	6/20/84
1-NE-VO-15-44	82-305	23.6	Tr, 0.070, Tr, 0.060[b] (0.040)[c]	Tr, 0.003, Tr, 0.0025	6/21/84
1-NE-VO-45+	82-306	25.5	0.16	0.0063	6/21/84
1-PA-VO-0-14	82-301	15.0	1.1	0.075	6/19/84
1-PA-VO-15-44	82-302	17.4	Tr, 0.10 (0.030)[c]	Tr, 0.057	6/20/84
1-PA-VO-45+	82-303	20.7	Tr, 0.050 (0.020)[c]	Tr, 0.0024	6/20/84
1-MA-VO-0-14	82-307	20.3	0.13	0.0064	6/27/84
1-MA-VO-15-44	82-308	25.0	0.16	0.0064	6/27/84
1-MA-VO-45+	82-309	15.5	0.21	0.014	6/27/84
2-MA-0-14	82-328	18.1	ND (0.14)[a]	ND (0.008)	7/12/84
2-MA-15-44	82-329	25.3	2.0	0.079	7/13/84
2-MA-VO-45+	82-330	17.8	Tr, 0.10 (0.030)[c]	Tr, 0.0056	7/13/84
1-EN-VO-0-14	82-310	12.7	0.56	0.044	6/28/84
1-EN-VO-15-44	82-311	20.8	12	0.58	6/28/84
1-EN-VO-45+	82-312	18.6	0.18	0.0097	6/28/84
2-EN-VO-0-14	82-331	17/3	0.32	0.019	7/17/84
2-EN-VO-15-44	82-332	21.1	1.7	0.082	7/23/84
2-EN-VO-45+	82-333	22.6	0.17	0.0075	7/23/84
3-EN-VO-15-44	82-341	19.6	0.16	0.0080	7/18/84
3-EN-VO-45+	82-342	21.4	Tr, 0.030 (0.020)[c]	Tr, 0.0014	7/18/84
1-WN-VO-0-14	82-313	18.9	ND (0.032)	ND (0.002)	6/29/84
1-WN-VO-15-44	82-314	21.6	0.31	0.014	6/29/84
1-WN-VO-45+	82-315	21.6	0.15	0.0070	7/2/84
2-WN-VO-45+	82-334	18.3	0.23	0.013	7/16/84

Table 4 (concluded)

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-SA-VO-0-14	82-316	12.6	1.8	0.14	7/3/84
1-SA-VO-15-44	82-317	22.2	1.3	0.059	7/3/84
1-SA-VO-45+	82-318	15.4	0.64	0.042	7/3/84
2-SA-VO-0-14	82-335	16.7	1.8	0.11	7/17/84
2-SA-VO-15-44	82-336	18.7	0.15	0.008	7/17/84
2-SA-VO-45+	82-337	23.2	0.83	0.036	7/17/84
3-SA-VO-15-44	82-343	10.1	3.0	0.30	7/20/84
3-SA-VO-45+	82-344	13.8	0.80	0.058	7/20/84
4-SA-VO-15-44	82-345	17.8	ND (0.07)	ND (0.004)	7/20/84
4-SA-VO-45+	82-346	11.6	ND (0.31)	ND (0.027)	7/20/84
1-ES-VO-0-14	82-319	25.6	ND (0.20)	ND (0.008)	7/9/84
1-ES-VO-15-44	82-320	19.0	ND (0.21)	ND (0.011)	7/9/84
1-ES-VO-45+	82-321	20.6	ND (0.20)	ND (0.010)	7/9/84
2-ES-VO-15-44	82-338	24.3	Tr, 0.088 (0.020)[c]	Tr, 0.0036	7/18/84
2-ES-VO-45+	82-339	19.3	ND (0.20)	ND (0.010)	7/20/84
1-WS-VO-0-14	82-322	6.0	ND (0.60)	ND (0.100)	7/11/84
1-WS-VO-15-44	82-323	22.4	0.29	0.013	7/11/84
1-WS-VO-45+	82-324	22.0	ND (0.74)	ND (0.034)	7/11/84
2-WS-VO-15-44	82-340	21.9	0.12	0.0053	7/18/84

[a]ND - Not detected. Value in parentheses represents the estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).
[b]The sample analysis was repeated due to an interruption of the HRGC temperature program during the first analysis.
[c]Value in parentheses represents the estimated detection limit for this sample.

Table 5. Data Report - 1,1,1-Trichloroethane (CAS No. 67-66-3) - FY82 Composite Adipose Tissue Samples

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-MO-VO-0-14	82-325	5.1	ND (1.2)[a]	ND (0.24)	7/11/84
1-MO-VO-15-44	82-326	18.8	0.33	0.018	7/12/84
1-MO-VO-45+	82-327	22.4	1.1	0.049	7/12/84
1-NE-VO-0-14	82-304	20.0	ND (0.44)	ND (0.022)	6/20/84
1-NE-VO-15-44	82-305	23.6	ND (0.44), ND (0.39)[b]	ND (0.019), ND (0.017)	6/21/84
1-NE-VO-45+	82-306	25.5	ND (2.7)	ND (0.11)	6/21/84
1-PA-VO-0-14	82-301	15.0	4.2	0.28	6/19/84
1-PA-VO-15-44	82-302	17.4	1.8	0.10	6/20/84
1-PA-VO-45+	82-303	20.7	ND (0.30)	ND (0.014)	6/20/84
1-MA-VO-0-14	82-307	20.3	ND (0.34)	ND (0.017)	6/27/84
1-MA-VO-15-44	82-308	25.0	2.4	0.097	6/27/84
1-MA-VO-45+	82-309	15.5	ND (0.43)	ND (0.028)	6/27/84
2-MA-0-14	82-328	18.1	ND (0.35)	ND (0.019)	7/12/84
2-MA-15-44	82-329	25.3	0.77	0.030	7/13/84
2-MA-VO-45+	82-330	17.8	ND (0.53)	ND (0.030)	7/13/84
1-EN-VO-0-14	82-310	12.7	ND (0.53)	ND (0.042)	6/28/84
1-EN-VO-15-44	82-311	20.8	ND (0.80)	ND (0.037)	6/28/84
1-EN-VO-45+	82-312	18.6	ND (0.89)	ND (0.048)	6/28/84
2-EN-VO-0-14	82-331	17.3	ND (0.41)	ND (0.024)	7/17/84
2-EN-VO-15-44	82-332	21.1	2.1	0.10	7/23/84
2-EN-VO-45+	82-333	22.6	ND (0.22)	ND (0.010)	7/23/84
3-EN-VO-15-44	82-341	19.6	ND (0.46)	ND (0.023)	7/18/84
3-EN-VO-45+	82-342	21.4	1.3	0.060	7/18/84
1-WN-VO-0-14	82-313	18.9	ND (0.47)	ND (0.024)	6/29/84
1-WN-VO-15-44	82-314	21.6	ND (0.47)	ND (0.022)	6/29/84
1-WN-VO-45+	82-315	21.6	0.58	0.027	7/2/84
2-WN-VO-45+	82-334	18.3	ND (0.040)	ND (0.022)	7/16/84

Table 5 (concluded)

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-SA-VO-0-14	82-316	12.6	ND (0.57)	ND (0.045)	7/3/84
1-SA-VO-15-44	82-317	22.2	0.79	0.036	7/3/84
1-SA-VO-45+	82-318	15.4	0.42	0.027	7/3/84
2-SA-VO-0-14	82-335	16.7	0.67	0.040	7/17/84
2-SA-VO-15-44	82-336	18.7	0.45	0.024	7/17/84
2-SA-VO-45+	82-337	23.2	2.1	0.091	7/17/84
3-SA-VO-15-44	82-343	10.1	1.0	0.099	7/20/84
3-SA-VO-45+	82-344	13.8	3.7	0.27	7/20/84
4-SA-VO-15-44	82-345	17.8	ND (0.94)	ND (0.053)	7/20/84
4-SA-VO-45+	82-346	11.6	ND (0.60)	ND (0.052)	7/20/84
1-ES-VO-0-14	82-319	25.6	0.46	0.018	7/9/84
1-ES-VO-15-44	82-320	19.0	ND (0.53)	ND (0.028)	7/9/84
1-ES-VO-45+	82-321	20.6	ND (0.53)	ND (0.021)	7/9/84
2-ES-VO-15-44	82-338	24.3	1.6	0.066	7/18/84
2-ES-VO-45+	82-339	19.3	2.0	0.10	7/20/84
1-WS-VO-0-14	82-322	6.0	5.0	0.83	7/11/84
1-WS-VO-15-44	82-323	22.4	ND (1.6)	ND (0.071)	7/11/84
1-WS-VO-45+	82-324	22.0	ND (1.9)	ND (0.084)	7/11/84
2-WS-VO-15-44	82-340	21.9	1.6	0.075	7/18/84

[a]ND - Not detected. Value in parentheses represents the estimated detection limit.
[b]The sample analysis was repeated due to an interruption of the HRGC temperature program during the first analysis.

Table 6. Data Report - Bromodichloromethane (CAS No. 75-27-4) - FY82 Composite Adipose Tissue Samples

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-MO-VO-0-14	82-325	5.1	ND (2.3)[a]	ND (0.45)	7/11/84
1-MO-VO-15-44	82-326	18.8	ND (1.0)	ND (0.053)	7/12/84
1-MO-VO-45+	82-327	22.4	ND (1.2)	ND (0.050)	7/12/84
1-NE-VO-0-14	82-304	20.0	ND (2.2)	ND (0.11)	6/20/84
1-NE-VO-15-44	82-305	23.6	ND (2.2), ND (4.2)[b]	ND (0.093), ND (0.18)	6/21/84
1-NE-VO-45+	82-306	25.5	ND (5.4)	ND (0.310)	6/21/84
1-PA-VO-0-14	82-301	15.0	ND (0.80)	ND (0.053)	6/19/84
1-PA-VO-15-44	82-302	17.4	ND (2.3)	ND (0.13)	6/20/84
1-PA-VO-45+	82-303	20.7	ND (1.1)	ND (0.053)	6/20/84
1-MA-VO-0-14	82-307	20.3	ND (0.76)	ND (0.037)	6/27/84
1-MA-VO-15-44	82-308	25.0	ND (0.90)	ND (0.040)	6/27/84
1-MA-VO-45+	82-309	15.5	ND (0.95)	ND (0.061)	6/27/84
2-MA-0-14	82-328	18.1	ND (0.70)	ND (0.039)	7/12/84
2-MA-15-44	82-329	25.3	ND (2.3)	ND (0.091)	7/13/84
2-MA-VO-45+	82-330	17.8	ND (1.8)	ND (0.10)	7/13/84
1-EN-VO-0-14	82-310	12.7	ND (1.5)	ND (0.12)	6/28/84
1-EN-VO-15-44	82-311	20.8	ND (2.2)	ND (0.11)	6/28/84
1-EN-VO-45+	82-312	18.6	ND (2.5)	ND (0.14)	6/28/84
2-EN-VO-0-14	82-331	17/3	ND (1.4)	ND (0.081)	7/17/84
2-EN-VO-15-44	82-332	21.1	ND (3.9)	ND (0.18)	7/23/84
2-EN-VO-45+	82-333	22.6	ND (0.89)	ND (0.039)	7/23/84
3-EN-VO-15-44	82-341	19.6	ND (1.8)	ND (0.091)	7/18/84
3-EN-VO-45+	82-342	21.4	ND (1.8)	ND (0.084)	7/18/84
1-WN-VO-0-14	82-313	18.9	ND (0.94)	ND (0.050)	6/29/84
1-WN-VO-15-44	82-314	21.6	ND (0.94)	ND (0.043)	6/29/84
1-WN-VO-45+	82-315	21.6	ND (1.0)	ND (0.048)	7/2/84
2-WN-VO-45+	82-334	18.3	ND (1.6)	ND (0.087)	7/16/84

Table 6 (concluded)

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-SA-VO-0-14	82-316	12.6	ND (1.9)	ND (0.15)	7/3/84
1-SA-VO-15-44	82-317	22.2	ND (1.0)	ND (0.06)	7/3/84
1-SA-VO-45+	82-318	15.4	ND (1.6)	ND (0.10)	7/3/84
2-SA-VO-0-14	82-335	16.7	ND (3.4)	ND (0.20)	7/17/84
2-SA-VO-15-44	82-336	18.7	ND (2.3)	ND (0.12)	7/17/84
2-SA-VO-45+	82-337	23.2	ND (1.1)	ND (0.050)	7/17/84
3-SA-VO-15-44	82-343	10.1	ND (1.4)	ND (0.14)	7/20/84
3-SA-VO-45+	82-344	13.8	ND (1.5)	ND (0.11)	7/20/84
4-SA-VO-15-44	82-345	17.8	ND (2.3)	ND (0.13)	7/20/84
4-SA-VO-45+	82-346	11.6	ND (1.5)	ND (0.13)	7/20/84
1-ES-VO-0-14	82-319	25.6	ND (0.53)	ND (0.021)	7/9/84
1-ES-VO-15-44	82-320	19.0	ND (0.53)	ND (0.028)	7/9/84
1-ES-VO-45+	82-321	20.6	ND (0.53)	ND (0.021)	7/9/84
2-ES-VO-15-44	82-338	24.3	ND (1.8)	ND (0.074)	7/18/84
2-ES-VO-45+	82-339	19.3	ND (1.4)	ND (0.073)	7/20/84
1-WS-VO-0-14	82-322	6.0	ND (3.0)	ND (0.50)	7/11/84
1-WS-VO-15-44	82-323	22.4	ND (3.2)	ND (0.14)	7/11/84
1-WS-VO-45+	82-324	22.0	ND (3.7)	ND (0.17)	7/11/84
2-WS-VO-15-44	82-340	21.9	ND (1.8)	ND (0.082)	7/18/84

[a]ND - Not detected. Value in parentheses represents the estimated detection limit.
[b]The sample analysis was repeated due to an interruption of the HRGC temperature program during the first analysis.

Table 7. Data Report - Benzene (CAS No. 71-43-2) - FY82 Composite Adipsoe Tissue Samples

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-MO-VO-0-14	82-325	5.1	0.49	0.097	7/11/84
1-MO-VO-15-44	82-326	18.8	0.38	0.020	7/12/84
1-MO-VO-45+	82-327	22.4	0.26	0.012	7/12/84
1-NE-VO-0-14	82-304	20.0	0.69	0.059	6/20/84
1-NE-VO-15-44	82-305	23.6	0.58, 0.63[b]	0.025, 0.027	6/21/84
1-NE-VO-45+	82-306	25.5	0.50	0.020	6/21/84
1-PA-VO-0-14	82-301	15.0	0.14	0.0090	6/19/84
1-PA-VO-15-44	82-302	17.4	0.22	0.013	6/20/84
1-PA-VO-45+	82-303	20.7	0.17	0.0082	6/20/84
1-MA-VO-0-14	82-307	20.3	0.13	0.0064	6/27/84
1-MA-VO-15-44	82-308	25.0	0.20	0.008	6/27/84
1-MA-VO-45+	82-309	15.5	0.20	0.013	6/27/84
2-MA-0-14	82-328	18.1	0.19	0.011	7/12/84
2-MA-15-44	82-329	25.3	0.64	0.025	7/13/84
2-MA-VO-45+	82-330	17.8	0.26	0.015	7/13/84
1-EN-VO-0-14	82-310	12.7	0.13	0.010	6/28/84
1-EN-VO-15-44	82-311	20.8	0.18	0.0087	6/28/84
1-EN-VO-45+	82-312	18.6	0.27	0.0145	6/28/84
2-EN-VO-0-14	82-331	17.3	0.31	0.018	7/17/84
2-EN-VO-15-44	82-332	21.1	0.47	0.022	7/23/84
2-EN-VO-45+	82-333	22.6	0.23	0.010	7/23/84
3-EN-VO-15-44	82-341	19.6	0.070	0.0035	7/18/84
3-EN-VO-45+	82-342	21.4	ND (0.095)[a]	ND (0.004)	7/18/84
1-WN-VO-0-14	82-313	18.9	0.090	0.0048	6/29/84
1-WN-VO-15-44	82-314	21.6	0.34	0.016	6/29/84
1-WN-VO-45+	82-315	21.6	0.10	0.0046	7/2/84
2-WN-VO-45+	82-334	18.3	0.12	0.0065	7/16/84

Table 7 (concluded)

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-SA-VO-0-14	82-316	12.6	0.19	0.015	7/3/84
1-SA-VO-15-44	82-317	22.2	0.30	0.014	7/3/84
1-SA-VO-45+	82-318	15.4	0.34	0.022	7/3/84
2-SA-VO-0-14	82-335	16.7	0.10	0.006	7/17/84
2-SA-VO-15-44	82-336	18.7	0.12	0.0064	7/17/84
2-SA-VO-45+	82-337	23.2	0.077	0.0033	7/17/84
3-SA-VO-15-44	82-343	10.1	0.10	0.010	7/20/84
3-SA-VO-45+	82-344	13.8	0.10	0.0072	7/20/84
4-SA-VO-15-44	82-345	17.8	0.14	0.0079	7/20/84
4-SA-VO-45+	82-346	11.6	0.043	0.0037	7/20/84
1-ES-VO-0-14	82-319	25.6	0.28	0.011	7/9/84
1-ES-VO-15-44	82-320	19.0	0.15	0.0079	7/9/84
1-ES-VO-45+	82-321	20.6	0.17	0.0083	7/9/84
2-ES-VO-15-44	82-338	24.3	0.098	0.0040	7/18/84
2-ES-VO-45+	82-339	19.3	0.05	0.0026	7/20/84
1-WS-VO-0-14	82-322	6.0	ND (0.08)	ND (0.013)	7/11/84
1-WS-VO-15-44	82-323	22.4	0.31	0.014	7/11/84
1-WS-VO-45+	82-324	22.0	0.51	0.023	7/11/84
2-WS-VO-15-44	82-340	21.9	0.067	0.0031	7/18/84

[a]ND - Not detected. Value in parentheses represents the estimated detection limit.
[b]The sample analysis was repeated due to an interruption of the HRGC temperature program during the first analysis.

Table 8. Data Report - Tetrachloroethene (CAS No. 127-18-4) - FY82 Composite Adipose Tissue Samples

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-MO-VO-0-14	82-325	5.1	ND (0.12)[a]	ND (0.024)	7/11/84
1-MO-VO-15-44	82-326	18.8	ND (0.07)	ND (0.004)	7/12/84
1-MO-VO-45+	82-327	22.4	Tr, 0.10 (0.040)[c]	Tr, 0.005	7/12/84
1-NE-VO-0-14	82-304	20.0	ND (0.08)	ND (0.004)	6/20/84
1-NE-VO-15-44	82-305	23.6	ND (0.08), ND (0.15)[b]	ND (0.003), ND (0.006)	6/21/84
1-NE-VO-45+	82-306	25.5	ND (0.80)	ND (0.031)	6/21/84
1-PA-VO-0-14	82-301	15.0	ND (0.060)	ND (0.004)	6/19/84
1-PA-VO-15-44	82-302	17.4	0.19	0.011	6/20/84
1-PA-VO-45+	82-303	20.7	Tr, 0.11 (0.020)[c]	Tr, 0.006	6/20/84
1-MA-VO-0-14	82-307	20.3	0.99	0.049	6/27/84
1-MA-VO-15-44	82-308	25.0	1.9	0.075	6/27/84
1-MA-VO-45+	82-309	15.5	1.5	0.094	6/27/84
2-MA-0-14	82-328	18.1	0.29	0.016	7/12/84
2-MA-15-44	82-329	25.3	0.76	0.030	7/13/84
2-MA-VO-45+	82-330	17.8	0.81	0.046	7/13/84
1-EN-VO-0-14	82-310	12.7	0.72	0.056	6/28/84
1-EN-VO-15-44	82-311	20.8	ND (0.33)	ND (0.016)	6/28/84
1-EN-VO-45+	82-312	18.6	ND (0.38)	ND (0.020)	6/28/84
2-EN-VO-0-14	82-331	17.3	ND (0.05)	ND (0.0029)	7/17/84
2-EN-VO-15-44	82-332	21.1	1.3	0.060	7/23/84
2-EN-VO-45+	82-333	22.6	1.9	0.085	7/23/84
3-EN-VO-15-44	82-341	19.6	0.29	0.015	7/18/84
3-EN-VO-45+	82-342	21.4	0.39	0.018	7/18/84
1-WN-VO-0-14	82-313	18.9	0.51	0.027	6/29/84
1-WN-VO-15-44	82-314	21.6	0.39	0.018	6/29/84
1-WN-VO-45+	82-315	21.6	0.79	0.037	7/2/84
2-WN-VO-45+	82-334	18.3	0.58	0.032	7/16/84

Table 8 (concluded)

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-SA-VO-0-14	82-316	12.6	ND (0.38)	ND (0.030)	7/3/84
1-SA-VO-15-44	82-317	22.2	1.6	0.072	7/3/84
1-SA-VO-45+	82-318	15.4	ND (0.31)	ND (0.020)	7/3/84
2-SA-VO-0-14	82-335	16.7	ND (0.050)	ND (0.003)	7/17/84
2-SA-VO-15-44	82-336	18.7	Tr, 0.11 (0.020)[c]	Tr, 0.006	7/17/84
2-SA-VO-45+	82-337	23.2	0.31	0.013	7/17/84
3-SA-VO-15-44	82-343	10.1	Tr, 0.061 (0.020)[c]	Tr, 0.006	7/20/84
3-SA-VO-45+	82-344	13.8	0.40	0.029	7/20/84
4-SA-VO-15-44	82-345	17.8	0.60	0.034	7/20/84
4-SA-VO-45+	82-346	11.6	ND (0.080)	ND (0.007)	7/20/84
1-ES-VO-0-14	82-319	25.6	ND (0.05)	ND (0.002)	7/9/84
1-ES-VO-15-44	82-320	19.0	0.54	0.029	7/9/84
1-ES-VO-45+	82-321	20.6	ND (0.05)	ND (0.003)	7/9/84
2-ES-VO-15-44	82-338	24.3	Tr, 0.11 (0.023)[c]	Tr, 0.0046 (0.001)[c]	7/18/84
2-ES-VO-45+	82-339	19.3	0.24	0.012	7/20/84
1-WS-VO-0-14	82-322	6.0	ND (0.20)	ND (0.033)	7/11/84
1-WS-VO-15-44	82-323	22.4	ND (0.16)	ND (0.007)	7/11/84
1-WS-VO-45+	82-324	22.0	ND (0.19)	ND (0.009)	7/11/84
2-WS-VO-15-44	82-340	21.9	0.35	0.016	7/18/84

[a]ND - Not detected. Value in parentheses represents the estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).
[b]The sample analysis was repeated due to an interruption of the HRGC temperature program during the first analysis.
[c]The value in parentheses reflects the estimated detection limit for this sample.

Table 9. Data Report - Dibromochloromethane - FY82 Composite Adipose Tissue Samples

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-MO-VO-0-14	82-325	5.1	ND (0.12)[a]	ND (0.024)	7/11/84
1-MO-VO-15-44	82-326	18.8	ND (0.1)	ND (0.005)	7/12/84
1-MO-VO-45+	82-327	22.4	ND (0.12)	ND (0.004)	7/12/84
1-NE-VO-0-14	82-304	20.0	ND (0.22)	ND (0.014)	6/20/84
1-NE-VO-15-44	82-305	23.6	ND (0.22), ND (0.42)[b]	ND (0.009), ND (0.018)	6/21/84
1-NE-VO-45+	82-306	25.5	ND (0.50)	ND (0.020)	6/21/84
1-PA-VO-0-14	82-301	15.0	ND (0.050)	ND (0.003)	6/19/84
1-PA-VO-15-44	82-302	17.4	ND (0.23)	ND (0.013)	6/20/84
1-PA-VO-45+	82-303	20.7	ND (0.11)	ND (0.005)	6/20/84
1-MA-VO-0-14	82-307	20.3	ND (0.19)	ND (0.010)	6/27/84
1-MA-VO-15-44	82-308	25.0	ND (0.25)	ND (0.010)	6/27/84
1-MA-VO-45+	82-309	15.5	ND (0.24)	ND (0.015)	6/27/84
2-MA-0-14	82-328	18.1	ND (0.070)	ND (0.004)	7/12/84
2-MA-15-44	82-329	25.3	ND (0.23)	ND (0.009)	7/13/84
2-MA-VO-45+	82-330	17.8	ND (0.18)	ND (0.010)	7/13/84
1-EN-VO-0-14	82-310	12.7	ND (0.15)	ND (0.012)	6/28/84
1-EN-VO-15-44	82-311	20.8	ND (0.22)	ND (0.011)	6/28/84
1-EN-VO-45+	82-312	18.6	ND (0.25)	ND (0.014)	6/28/84
2-EN-VO-0-14	82-331	17.3	ND (0.14)	ND (0.008)	7/17/84
2-EN-VO-15-44	82-332	21.1	ND (0.39)	ND (0.018)	7/23/84
2-EN-VO-45+	82-333	22.6	ND (0.09)	ND (0.004)	7/23/84
3-EN-VO-15-44	82-341	19.6	ND (0.080)	ND (0.004)	7/18/84
3-EN-VO-45+	82-342	21.4	ND (0.08)	ND (0.004)	7/18/84
1-WN-VO-0-14	82-313	18.9	ND (0.14)	ND (0.007)	6/29/84
1-WN-VO-15-44	82-314	21.6	ND (0.14)	ND (0.007)	6/29/84
1-WN-VO-45+	82-315	21.6	ND (0.21)	ND (0.010)	7/2/84
2-WN-VO-45+	82-334	18.3	ND (0.16)	ND (0.009)	7/16/84

Table 9 (concluded)

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-SA-VO-0-14	82-316	12.6	ND (0.050)	ND (0.004)	7/3/84
1-SA-VO-15-44	82-317	22.2	ND (0.030)	ND (0.001)	7/3/84
1-SA-VO-45+	82-318	15.4	ND (0.040)	ND (0.003)	7/3/84
2-SA-VO-0-14	82-335	16.7	ND (0.17)	ND (0.010)	7/17/84
2-SA-VO-15-44	82-336	18.7	ND (0.12)	ND (0.006)	7/17/84
2-SA-VO-45+	82-337	23.2	ND (0.060)	ND (0.003)	7/17/84
3-SA-VO-15-44	82-343	10.1	ND (0.11)	ND (0.011)	7/20/84
3-SA-VO-45+	82-344	13.8	ND (0.12)	ND (0.009)	7/20/84
4-SA-VO-15-44	82-345	17.8	ND (0.19)	ND (0.011)	7/20/84
4-SA-VO-45+	82-346	11.6	ND (0.12)	ND (0.010)	7/20/84
1-ES-VO-0-14	82-319	25.6	ND (0.06)	ND (0.002)	7/9/84
1-ES-VO-15-44	82-320	19.0	ND (0.06)	ND (0.003)	7/9/84
1-ES-VO-45+	82-321	20.6	ND (0.06)	ND (0.002)	7/9/84
2-ES-VO-15-44	82-338	24.3	ND (0.08)	ND (0.003)	7/18/84
2-ES-VO-45+	82-339	19.3	ND (0.11)	ND (0.006)	7/20/84
1-WS-VO-0-14	82-322	6.0	ND (0.20)	ND (0.033)	7/11/84
1-WS-VO-15-44	82-323	22.4	ND (0.16)	ND (0.007)	7/11/84
1-WS-VO-45+	82-324	22.0	ND (0.08)	ND (0.009)	7/11/84
2-WS-VO-15-44	82-340	21.9	ND (0.19)	ND (0.004)	7/18/84

[a]ND - Not detected. Value in parentheses represents the estimated detection limit.
[b]The sample analysis was repeated due to an interruption of the HRGC temperature program during the first analysis.

Table 10. Data Report - 1,1,2-Trichloroethane (CAS No. 79-00-5) - FY82 Composite Adipose Tissue Survey

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-MO-VO-0-14	82-325	5.1	ND (0.23)[a]	ND (0.045)	7/11/84
1-MO-VO-15-44	82-326	18.8	ND (0.07)	ND (0.004)	7/12/84
1-MO-VO-45+	82-327	22.4	ND (0.08)	ND (0.004)	7/12/84
1-NE-VO-0-14	82-304	20.0	ND (0.22)	ND (0.011)	6/20/84
1-NE-VO-15-44	82-305	23.6	ND (0.22), ND (0.42)[b]	ND (0.009), ND (0.018)	6/21/84
1-NE-VO-45+	82-306	25.5	ND (0.50)	ND (0.020)	6/21/84
1-PA-VO-0-14	82-301	15.0	ND (0.30)	ND (0.020)	6/19/84
1-PA-VO-15-44	82-302	17.4	ND (0.23)	ND (0.013)	6/20/84
1-PA-VO-45+	82-303	20.7	ND (0.11)	ND (0.005)	6/20/84
1-MA-VO-0-14	82-307	20.3	ND (0.11)	ND (0.005)	6/27/84
1-MA-VO-15-44	82-308	25.0	ND (0.15)	ND (0.006)	6/27/84
1-MA-VO-45+	82-309	15.5	ND (0.14)	ND (0.009)	6/27/84
2-MA-0-14	82-328	18.1	ND (0.050)	ND (0.003)	7/12/84
2-MA-15-44	82-329	25.3	ND (0.12)	ND (0.005)	7/13/84
2-MA-VO-45+	82-330	17.8	ND (0.09)	ND (0.005)	7/13/84
1-EN-VO-0-14	82-310	12.7	ND (0.11)	ND (0.009)	6/28/84
1-EN-VO-15-44	82-311	20.8	ND (0.17)	ND (0.008)	6/28/84
1-EN-VO-45+	82-312	18.6	ND (0.19)	ND (0.010)	6/28/84
2-EN-VO-0-14	82-331	17.3	ND (0.07)	ND (0.004)	7/17/84
2-EN-VO-15-44	82-332	21.1	ND (0.19)	ND (0.009)	7/23/84
2-EN-VO-45+	82-333	22.6	ND (0.04)	ND (0.002)	7/23/84
3-EN-VO-15-44	82-341	19.6	ND (0.060)	ND (0.003)	7/18/84
3-EN-VO-45+	82-342	21.4	ND (0.06)	ND (0.003)	7/18/84
1-WN-VO-0-14	82-313	18.9	ND (0.094)	ND (0.005)	6/29/84
1-WN-VO-15-44	82-314	21.6	ND (0.094)	ND (0.004)	6/29/84
1-WN-VO-45+	82-315	21.6	ND (0.021)	ND (0.001)	7/2/84
2-WN-VO-45+	82-334	18.3	ND (0.08)	ND (0.004)	7/16/84

Table 10 (concluded)

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-SA-VO-0-14	82-316	12.6	ND (0.050)	ND (0.004)	7/3/84
1-SA-VO-15-44	82-317	22.2	ND (0.030)	ND (0.001)	7/3/84
1-SA-VO-45+	82-318	15.4	ND (0.040)	ND (0.003)	7/3/84
2-SA-VO-0-14	82-335	16.7	ND (0.14)	ND (0.008)	7/17/84
2-SA-VO-15-44	82-336	18.7	ND (0.090)	ND (0.005)	7/17/84
2-SA-VO-45+	82-337	23.2	ND (0.050)	ND (0.002)	7/17/84
3-SA-VO-15-44	82-343	10.1	ND (0.083)	ND (0.008)	7/20/84
3-SA-VO-45+	82-344	13.8	ND (0.090)	ND (0.006)	7/20/84
4-SA-VO-15-44	82-345	17.8	ND (0.140)	ND (0.008)	7/20/84
4-SA-VO-45+	82-346	11.6	ND (0.090)	ND (0.008)	7/20/84
1-ES-VO-0-14	82-319	25.6	ND (0.11)	ND (0.004)	7/9/84
1-ES-VO-15-44	82-320	19.0	ND (0.11)	ND (0.006)	7/9/84
1-ES-VO-45+	82-321	20.6	ND (0.11)	ND (0.005)	7/9/84
2-ES-VO-15-44	82-338	24.3	ND (0.06)	ND (0.002)	7/18/84
2-ES-VO-45+	82-339	19.3	ND (0.08)	ND (0.004)	7/20/84
1-WS-VO-0-14	82-322	6.0	ND (0.30)	ND (0.050)	7/11/84
1-WS-VO-15-44	82-323	22.4	ND (0.32)	ND (0.014)	7/11/84
1-WS-VO-45+	82-324	22.0	ND (0.37)	ND (0.017)	7/11/84
2-WS-VO-15-44	82-340	21.9	ND (0.06)	ND (0.003)	7/18/84

[a]ND - Not detected. Value in parentheses represents the estimated detection limit.
[b]The sample analysis was repeated due to an interruption of the HRGC temperature program during the first analysis.

Table 11. Data Report - Toluene (CAS No. 188-88-3) - FY82 Composite Adipose Tissue Samples

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-MO-VO-0-14	82-325	5.1	0.18	0.035	7/11/84
1-MO-VO-15-44	82-326	18.8	0.28	0.015	7/12/84
1-MO-VO-45+	82-327	22.4	0.55	0.025	7/12/84
1-NE-VO-0-14	82-304	20.0	0.44	0.022	6/20/84
1-NE-VO-15-44	82-305	23.6	1.0, 1.2[b]	0.042, 0.051	6/21/84
1-NE-VO-45+	82-306	25.5	0.38	0.015	6/21/84
1-PA-VO-0-14	82-301	15.0	0.17	0.011	6/19/84
1-PA-VO-15-44	82-302	17.4	0.34	0.020	6/20/84
1-PA-VO-45+	82-303	20.7	0.26	0.013	6/20/84
1-MA-VO-0-14	82-307	20.3	0.090	0.0044	6/27/84
1-MA-VO-15-44	82-308	25.0	0.17	0.0068	6/27/84
1-MA-VO-45+	82-309	15.5	0.21	0.014	6/27/84
2-MA-0-14	82-328	18.1	0.14	0.0077	7/12/84
2-MA-15-44	82-329	25.3	0.23	0.0091	7/13/84
2-MA-VO-45+	82-330	17.8	ND (0.004)[a]	ND (0.0002)	7/13/84
1-EN-VO-0-14	82-310	12.7	0.36	0.028	6/28/84
1-EN-VO-15-44	82-311	20.8	0.72	0.035	6/28/84
1-EN-VO-45+	82-312	18.6	0.96	0.052	6/28/84
2-EN-VO-0-14	82-331	17.3	0.33	0.019	7/17/84
2-EN-VO-15-44	82-332	21.1	0.54	0.026	7/23/84
2-EN-VO-45+	82-333	22.6	5.6	0.250	7/23/84
3-EN-VO-15-44	82-341	19.6	0.17	0.009	7/18/84
3-EN-VO-45+	82-342	21.4	0.32	0.015	7/18/84
1-WN-VO-0-14	82-313	18.9	0.15	0.008	6/29/84
1-WN-VO-15-44	82-314	21.6	0.40	0.019	6/29/84
1-WN-VO-45+	82-315	21.6	0.13	0.006	7/2/84
2-WN-VO-45+	82-334	18.3	0.055	0.003	7/16/84

Table 11 (concluded)

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-SA-VO-0-14	82-316	12.6	0.36	0.029	7/3/84
1-SA-VO-15-44	82-317	22.2	0.84	0.038	7/3/84
1-SA-VO-45+	82-318	15.4	0.45	0.029	7/3/84
2-SA-VO-0-14	82-335	16.7	ND (0.003)	ND (0.0002)	7/17/84
2-SA-VO-15-44	82-336	18.7	0.023	0.0012	7/17/84
2-SA-VO-45+	82-337	23.2	0.28	0.012	7/17/84
3-SA-VO-15-44	82-343	10.1	0.41	0.041	7/20/84
3-SA-VO-45+	82-344	13.8	0.45	0.033	7/20/84
4-SA-VO-15-44	82-345	17.8	0.61	0.034	7/20/84
4-SA-VO-45+	82-346	11.6	ND (0.005)	ND (0.0004)	7/20/84
1-ES-VO-0-14	82-319	25.6	0.34	0.013	7/9/84
1-ES-VO-15-44	82-320	19.0	0.34	0.018	7/9/84
1-ES-VO-45+	82-321	20.6	0.33	0.016	7/9/84
2-ES-VO-15-44	82-338	24.3	0.19	0.0076	7/18/84
2-ES-VO-45+	82-339	19.3	0.050	0.0025	7/20/84
1-WS-VO-0-14	82-322	6.0	0.22	0.037	7/11/84
1-WS-VO-15-44	82-323	22.4	ND (0.004)	ND (0.0002)	7/11/84
1-WS-VO-45+	82-324	22.0	0.76	0.035	7/11/84
2-WS-VO-15-44	82-340	21.9	0.18	0.0084	7/18/84

[a]ND - Not detected. Value in parentheses represents the estimated detection limit.
[b]The sample analysis was repeated due to an interruption of the HRGC temperature program during the first analysis.

Table 12. Data Report - Chlorobenzene (CAS No. 108-90-7) - FY82 Composite Adipose Tissue Samples

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-MO-VO-0-14	82-325	5.1	Tr, 0.011 (0.004)[c]	Tr, 0.0022	7/11/84
1-MO-VO-15-44	82-326	18.8	0.12	0.0064	7/12/84
1-MO-VO-45+	82-327	22.4	0.090	0.004	7/12/84
1-NE-VO-0-14	82-304	20.0	0.040	0.002	6/20/84
1-NE-VO-15-44	82-305	23.6	0.10	0.0042	6/21/84
1-NE-VO-45+	82-306	25.5	0.060	0.0024	6/21/84
1-PA-VO-0-14	82-301	15.0	0.030	0.002	6/19/84
1-PA-VO-15-44	82-302	17.4	0.040	0.0023	6/20/84
1-PA-VO-45+	82-303	20.7	0.020	0.001	6/20/84
1-MA-VO-0-14	82-307	20.3	0.040	0.002	6/27/84
1-MA-VO-15-44	82-308	25.0	0.060	0.0024	6/27/84
1-MA-VO-45+	82-309	15.5	0.050	0.003	6/27/84
2-MA-0-14	82-328	18.1	Tr, 0.011 (0.005)[c]	Tr, 0.0006	7/12/84
2-MA-15-44	82-329	25.3	0.17	0.0067	7/13/84
2-MA-VO-45+	82-330	17.8	0.044	0.0025	7/13/84
1-EN-VO-0-14	82-310	12.7	0.030	0.0024	6/28/84
1-EN-VO-15-44	82-311	20.8	0.13	0.0063	6/28/84
1-EN-VO-45+	82-312	18.6	0.030	0.0016	6/28/84
2-EN-VO-0-14	82-331	17.3	0.036	0.0021	7/17/84
2-EN-VO-15-44	82-332	21.1	0.030	0.0014	7/23/84
2-EN-VO-45+	82-333	22.6	0.042	0.0019	7/23/84
3-EN-VO-15-44	82-341	19.6	0.042	0.0021	7/18/84
3-EN-VO-45+	82-342	21.4	0.12	0.0056	7/18/84
1-WN-VO-0-14	82-313	18.9	0.020	0.0011	6/29/84
1-WN-VO-15-44	82-314	21.6	0.020	0.0009	6/29/84
1-WN-VO-45+	82-315	21.6	0.020	0.0009	7/2/84
2-WN-VO-45+	82-334	18.3	0.032	0.0017	7/16/84

Table 12 (concluded)

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-SA-VO-0-14	82-316	12.6	0.27	0.021	7/3/84
1-SA-VO-15-44	82-317	22.2	0.26	0.012	7/3/84
1-SA-VO-45+	82-318	15.4	ND (0.040)[a]	ND (0.003)	7/3/84
2-SA-VO-0-14	82-335	16.7	0.033	0.002	7/17/84
2-SA-VO-15-44	82-336	18.7	0.083	0.0044	7/17/84
2-SA-VO-45+	82-337	23.2	0.053	0.0023	7/17/84
3-SA-VO-15-44	82-343	10.1	0.070	0.0069	7/20/84
3-SA-VO-45+	82-344	13.8	0.025	0.0018	7/20/84
4-SA-VO-15-44	82-345	17.8	0.030	0.0017	7/20/84
4-SA-VO-45+	82-346	11.6	ND (0.015)	ND (0.001)	7/20/84
1-ES-VO-0-14	82-319	25.6	0.34	0.0038	7/9/84
1-ES-VO-15-44	82-320	19.0	0.34	0.0017	7/9/84
1-ES-VO-45+	82-321	20.6	0.33	0.0026	7/9/84
2-ES-VO-15-44	82-338	24.3	0.19	0.0039	7/18/84
2-ES-VO-45+	82-339	19.3	0.050	0.0016	7/20/84
1-WS-VO-0-14	82-322	6.0	0.015	0.0025	7/11/84
1-WS-VO-15-44	82-323	22.4	0.063	0.003	7/11/84
1-WS-VO-45+	82-324	22.0	0.19	0.0086	7/11/84
2-WS-VO-15-44	82-340	21.9	0.031	0.0014	7/18/84

[a]ND - Not detected. Value in parentheses represents the estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).
[b]The sample analysis was repeated due to an interruption of the HRGC temperature program during the first analysis.
[c]The value in parentheses is the estimated detection limit for this sample.

Table 13. Data Report - Ethyl Benzene (CAS No. 100-41-4) - FY82 Composite Adipose Tissue Samples

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-MO-VO-0-14	82-325	5.1	0.12	0.024	7/11/84
1-MO-VO-15-44	82-326	18.8	0.40	0.021	7/12/84
1-MO-VO-45+	82-327	22.4	0.66	0.030	7/12/84
1-NE-VO-0-14	82-304	20.0	2.9	0.145	6/20/84
1-NE-VO-15-44	82-305	23.6	1.7, 2.1[b]	0.072, 0.089	6/21/84
1-NE-VO-45+	82-306	25.5	1.7	0.067	6/21/84
1-PA-VO-0-14	82-301	15.0	ND (0.040)[a]	ND (0.003)	6/19/84
1-PA-VO-15-44	82-302	17.4	0.68	0.039	6/20/84
1-PA-VO-45+	82-303	20.7	0.58	0.028	6/20/84
1-MA-VO-0-14	82-307	20.3	0.17	0.0084	6/27/84
1-MA-VO-15-44	82-308	25.0	0.35	0.014	6/27/84
1-MA-VO-45+	82-309	15.5	0.21	0.014	6/27/84
2-MA-0-14	82-328	18.1	0.12	0.0066	7/12/84
2-MA-15-44	82-329	25.3	0.31	0.012	7/13/84
2-MA-VO-45+	82-330	17.8	0.001	0.0001	7/13/84
1-EN-VO-0-14	82-310	12.7	1.7	0.130	6/28/84
1-EN-VO-15-44	82-311	20.8	2.0	0.096	6/28/84
1-EN-VO-45+	82-312	18.6	0.91	0.049	6/28/84
2-EN-VO-0-14	82-331	17.3	1.0	0.060	7/17/84
2-EN-VO-15-44	82-332	21.1	0.64	0.030	7/23/84
2-EN-VO-45+	82-333	22.6	0.94	0.042	7/23/84
3-EN-VO-15-44	82-341	19.6	0.42	0.022	7/18/84
3-EN-VO-45+	82-342	21.4	0.72	0.034	7/18/84
1-WN-VO-0-14	82-313	18.9	0.32	0.017	6/29/84
1-WN-VO-15-44	82-314	21.6	0.99	0.046	6/29/84
1-WN-VO-45+	82-315	21.6	0.16	0.0074	7/2/84
2-WN-VO-45+	82-334	18.3	0.53	0.029	7/16/84

Table 13 (concluded)

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-SA-VO-0-14	82-316	12.6	0.85	0.068	7/3/84
1-SA-VO-15-44	82-317	22.2	2.0	0.090	7/3/84
1-SA-VO-45+	82-318	15.4	1.3	0.084	7/3/84
2-SA-VO-0-14	82-335	16.7	3.5	0.21	7/17/84
2-SA-VO-15-44	82-336	18.7	1.5	0.080	7/17/84
2-SA-VO-45+	82-337	23.2	1.7	0.073	7/17/84
3-SA-VO-15-44	82-343	10.1	1.8	0.18	7/20/84
3-SA-VO-45+	82-344	13.8	1.6	0.12	7/20/84
4-SA-VO-15-44	82-345	17.8	1.2	0.067	7/20/84
4-SA-VO-45+	82-346	11.6	Tr, 0.023 (0.010)[c]	Tr, 0.002	7/20/84
1-ES-VO-0-14	82-319	25.6	ND (0.05)	ND (0.002)	7/9/84
1-ES-VO-15-44	82-320	19.0	0.17	0.009	7/9/84
1-ES-VO-45+	82-321	20.6	0.26	0.013	7/9/84
2-ES-VO-15-44	82-338	24.3	0.30	0.012	7/18/84
2-ES-VO-45+	82-339	19.3	0.30	0.016	7/20/84
1-WS-VO-0-14	82-322	6.0	1.7	0.280	7/11/84
1-WS-VO-15-44	82-323	22.4	5.6	0.250	7/11/84
1-WS-VO-45+	82-324	22.0	3.7	0.168	7/11/84
2-WS-VO-15-44	82-340	21.9	1.4	0.064	7/18/84

[a]ND - Not detected. Value in parentheses represents the estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).
[b]The sample analysis was repeated due to an interruption of the HRGC temperature program during the first analysis.
[c]The value in parentheses is the estimated detection limit for this sample.

Table 14. Data Report - Bromoform (CAS No. 75-25-2) - FY82 Composite Adipose Tissue Samples

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-MO-VO-0-14	82-325	5.1	ND (0.23)[a]	ND (0.045)	7/11/84
1-MO-VO-15-44	82-326	18.8	ND (0.10)	ND (0.005)	7/12/84
1-MO-VO-45+	82-327	22.4	ND (0.12)	ND (0.005)	7/12/84
1-NE-VO-0-14	82-304	20.0	ND (0.22)	ND (0.011)	6/20/84
1-NE-VO-15-44	82-305	23.6	ND (0.22), ND (0.42)[b]	ND (0.009), ND (0.018)	6/21/84
1-NE-VO-45+	82-306	25.5	ND (0.30)	ND (0.012)	6/21/84
1-PA-VO-0-14	82-301	15.0	ND (0.30)	ND (0.020)	6/19/84
1-PA-VO-15-44	82-302	17.4	ND (0.23)	ND (0.013)	6/20/84
1-PA-VO-45+	82-303	20.7	ND (0.11)	ND (0.005)	6/20/84
1-MA-VO-0-14	82-307	20.3	ND (0.11)	ND (0.005)	6/27/84
1-MA-VO-15-44	82-308	25.0	ND (0.15)	ND (0.006)	6/27/84
1-MA-VO-45+	82-309	15.5	ND (0.14)	ND (0.009)	6/27/84
2-MA-0-14	82-328	18.1	ND (0.070)	ND (0.004)	7/12/84
2-MA-15-44	82-329	25.3	ND (0.19)	ND (0.008)	7/13/84
2-MA-VO-45+	82-330	17.8	ND (0.14)	ND (0.008)	7/13/84
1-EN-VO-0-14	82-310	12.7	ND (0.46)	ND (0.036)	6/28/84
1-EN-VO-15-44	82-311	20.8	ND (0.67)	ND (0.032)	6/28/84
1-EN-VO-45+	82-312	18.6	ND (0.076)	ND (0.004)	6/28/84
2-EN-VO-0-14	82-331	17.3	ND (0.11)	ND (0.006)	7/17/84
2-EN-VO-15-44	82-332	21.1	ND (0.19)	ND (0.009)	7/23/84
2-EN-VO-45+	82-333	22.6	ND (0.01)	ND (0.0004)	7/23/84
3-EN-VO-15-44	82-341	19.6	ND (0.008)	ND (0.0004)	7/18/84
3-EN-VO-45+	82-342	21.4	ND (0.08)	ND (0.004)	7/18/84
1-WN-VO-0-14	82-313	18.9	ND (0.094)	ND (0.005)	6/29/84
1-WN-VO-15-44	82-314	21.6	ND (0.094)	ND (0.004)	6/29/84
1-WN-VO-45+	82-315	21.6	ND (0.052)	ND (0.002)	7/2/84
2-WN-VO-45+	82-334	18.3	ND (0.080)	ND (0.004)	7/16/84

Table 14 (concluded)

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-SA-VO-0-14	82-316	12.6	ND (0.10)	ND (0.008)	7/3/84
1-SA-VO-15-44	82-317	22.2	ND (0.050)	ND (0.002)	7/3/84
1-SA-VO-45+	82-318	15.4	ND (0.050)	ND (0.003)	7/3/84
2-SA-VO-0-14	82-335	16.7	ND (0.17)	ND (0.010)	7/17/84
2-SA-VO-15-44	82-336	18.7	ND (0.12)	ND (0.006)	7/17/84
2-SA-VO-45+	82-337	23.2	ND (0.060)	ND (0.003)	7/17/84
3-SA-VO-15-44	82-343	10.1	ND (0.11)	ND (0.011)	7/20/84
3-SA-VO-45+	82-344	13.8	ND (0.12)	ND (0.009)	7/20/84
4-SA-VO-15-44	82-345	17.8	ND (0.19)	ND (0.011)	7/20/84
4-SA-VO-45+	82-346	11.6	ND (0.12)	ND (0.010)	7/20/84
1-ES-VO-0-14	82-319	25.6	ND (0.16)	ND (0.006)	7/9/84
1-ES-VO-15-44	82-320	19.0	ND (0.16)	ND (0.008)	7/9/84
1-ES-VO-45+	82-321	20.6	ND (0.16)	ND (0.008)	7/9/84
2-ES-VO-15-44	82-338	24.3	ND (0.08)	ND (0.003)	7/18/84
2-ES-VO-45+	82-339	19.3	ND (0.11)	ND (0.006)	7/20/84
1-WS-VO-0-14	82-322	6.0	ND (0.30)	ND (0.050)	7/11/84
1-WS-VO-15-44	82-323	22.4	ND (0.32)	ND (0.014)	7/11/84
1-WS-VO-45+	82-324	22.0	ND (0.37)	ND (0.017)	7/11/84
2-WS-VO-15-44	82-340	21.9	ND (0.08)	ND (0.004)	7/18/84

[a]ND - Not detected. Value in parentheses represents the estimated detection limit.
[b]The sample analysis was repeated due to an interruption of the HRGC temperature program during the first analysis.

Table 15. Data Report - Styrene (CAS No. 100-42-5) - FY82 Composite Adipose Tissue Samples

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-MO-VO-0-14	82-325	5.1	1.8	0.353	7/11/84
1-MO-VO-15-44	82-326	18.8	1.8	0.096	7/12/84
1-MO-VO-45+	82-327	22.4	1.7	0.076	7/12/84
1-NE-VO-0-14	82-304	20.0	2.2	0.11	6/20/84
1-NE-VO-15-44	82-305	23.6	4.1, 3.7[a]	0.17, 0.16	6/21/84
1-NE-VO-45+	82-306	25.5	3.2	0.12	6/21/84
1-PA-VO-0-14	82-301	15.0	0.75	0.050	6/19/84
1-PA-VO-15-44	82-302	17.4	2.5	0.14	6/20/84
1-PA-VO-45+	82-303	20.7	1.0	0.050	6/20/84
1-MA-VO-0-14	82-307	20.3	0.84	0.041	6/27/84
1-MA-VO-15-44	82-308	25.0	0.98	0.039	6/27/84
1-MA-VO-45+	82-309	15.5	0.69	0.045	6/27/84
2-MA-0-14	82-328	18.1	0.80	0.044	7/12/84
2-MA-15-44	82-329	25.3	0.98	0.039	7/13/84
2-MA-VO-45+	82-330	17.8	0.74	0.042	7/13/84
1-EN-VO-0-14	82-310	12.7	3.2	0.25	6/28/84
1-EN-VO-15-44	82-311	20.8	2.7	0.13	6/28/84
1-EN-VO-45+	82-312	18.6	2.2	0.12	6/29/84
2-EN-VO-0-14	82-331	17.3	0.64	0.037	7/17/84
2-EN-VO-15-44	82-332	21.1	1.7	0.081	7/23/84
2-EN-VO-45+	82-333	22.6	1.4	0.061	7/23/84
3-EN-VO-15-44	82-341	19.6	0.90	0.046	7/18/84
3-EN-VO-45+	82-342	21.4	1.3	0.061	7/18/84
1-WN-VO-0-14	82-313	18.9	0.30	0.016	6/29/84
1-WN-VO-15-44	82-314	21.6	0.61	0.028	6/29/84
1-WN-VO-45+	82-315	21.6	0.18	0.008	7/2/84
2-WN-VO-45+	82-334	18.3	0.55	0.030	7/16/84

Table 15 (concluded)

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-SA-VO-0-14	82-316	12.6	1.3	0.10	7/3/84
1-SA-VO-15-44	82-317	22.2	1.6	0.072	7/3/84
1-SA-VO-45+	82-318	15.4	1.2	0.078	7/3/84
2-SA-VO-0-14	82-335	16.7	3.0	0.18	7/17/84
2-SA-VO-15-44	82-336	18.7	1.3	0.070	7/17/84
2-SA-VO-45+	82-337	23.2	1.5	0.065	7/17/84
3-SA-VO-15-44	82-343	10.1	3.3	0.32	7/20/84
3-SA-VO-45+	82-344	13.8	1.6	0.12	7/20/84
4-SA-VO-15-44	82-345	17.8	1.3	0.073	7/20/84
4-SA-VO-45+	82-346	11.6	0.11	0.0095	7/20/84
1-ES-VO-0-14	82-319	25.6	0.96	0.038	7/9/84
1-ES-VO-15-44	82-320	19.0	1.5	0.079	7/9/84
1-ES-VO-45+	82-321	20.6	0.95	0.046	7/9/84
2-ES-VO-15-44	82-338	24.3	0.69	0.028	7/18/84
2-ES-VO-45+	82-339	19.3	0.89	0.046	7/20/84
1-WS-VO-0-14	82-322	6.0	1.5	0.25	7/11/84
1-WS-VO-15-44	82-323	22.4	1.4	0.063	7/11/84
1-WS-VO-45+	82-324	22.0	3.0	0.14	7/11/84
2-WS-VO-15-44	82-340	21.9	0.90	0.041	7/18/84

[a]The sample analysis was repeated due to an interruption of the HRGC temperature program during the first analysis.

Table 16. Data Report - 1,1,2,2-Tetrachloroethane (CAS No. 79-34-5) - FY82 Composite Adipose Tissue Samples

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-MO-VO-0-14	82-325	5.1	ND (0.007)[a]	ND (0.002)	7/11/84
1-MO-VO-15-44	82-326	18.8	ND (0.005)	ND (0.0003)	7/12/84
1-MO-VO-45+	82-327	22.4	ND (0.009)	ND (0.0004)	7/12/84
1-NE-VO-0-14	82-304	20.0	ND (0.020)	ND (0.001)	6/20/84
1-NE-VO-15-44	82-305	23.6	ND (0.030)	ND (0.001)	6/21/84
1-NE-VO-45+	82-306	25.5	ND (0.020)	ND (0.0008)	6/21/84
1-PA-VO-0-14	82-301	15.0	ND (0.010)	ND (0.0007)	6/19/84
1-PA-VO-15-44	82-302	17.4	ND (0.020)	ND (0.001)	6/20/84
1-PA-VO-45+	82-303	20.7	ND (0.010)	ND (0.0005)	6/20/84
1-MA-VO-0-14	82-307	20.3	ND (0.006)	ND (0.0003)	6/27/84
1-MA-VO-15-44	82-308	25.0	ND (0.010)	ND (0.0004)	6/27/84
1-MA-VO-45+	82-309	15.5	ND (0.012)	ND (0.001)	6/27/84
2-MA-0-14	82-328	18.1	ND (0.008)	ND (0.0004)	7/12/84
2-MA-15-44	82-329	25.3	ND (0.010)	ND (0.0004)	7/13/84
2-MA-VO-45+	82-330	17.8	ND (0.01)	ND (0.0006)	7/13/84
1-EN-VO-0-14	82-310	12.7	ND (0.001)	ND (0.0001)	6/28/84
1-EN-VO-15-44	82-311	20.8	0.040	0.0019	6/28/84
1-EN-VO-45+	82-312	18.6	ND (0.006)	ND (0.0003)	6/28/84
2-EN-VO-0-14	82-331	17.3	ND (0.090)	ND (0.005)	7/17/84
2-EN-VO-15-44	82-332	21.1	ND (0.010)	ND (0.0005)	7/23/84
2-EN-VO-45+	82-333	22.6	ND (0.007)	ND (0.0003)	7/23/84
3-EN-VO-15-44	82-341	19.6	ND (0.006)	ND (0.0003)	7/18/84
3-EN-VO-45+	82-342	21.4	ND (0.007)	ND (0.0003)	7/18/84
1-WN-VO-0-14	82-313	18.9	ND (0.001)	ND (0.0001)	6/29/84
1-WN-VO-15-44	82-314	21.6	ND (0.001)	ND (0.0001)	6/29/84
1-WN-VO-45+	82-315	21.6	ND (0.003)	ND (0.0001)	7/2/84
2-WN-VO-45+	82-334	18.3	ND (0.09)	ND (0.005)	7/16/84

Table 16 (concluded)

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (µg)	Concentration - wet tissue (µg/g)	Analysis date
1-SA-VO-0-14	82-316	12.6	ND (0.002)	ND (0.0002)	7/3/84
1-SA-VO-15-44	82-317	22.2	ND (0.002)	ND (0.0001)	7/3/84
1-SA-VO-45+	82-318	15.4	ND (0.001)	ND (0.0001)	7/3/84
2-SA-VO-0-14	82-335	16.7	ND (0.010)	ND (0.0006)	7/17/84
2-SA-VO-15-44	82-336	18.7	ND (0.006)	ND (0.0003)	7/17/84
2-SA-VO-45+	82-337	23.2	ND (0.007)	ND (0.0003)	7/17/84
3-SA-VO-15-44	82-343	10.1	ND (0.040)	ND (0.004)	7/20/84
3-SA-VO-45+	82-344	13.8	ND (0.007)	ND (0.0005)	7/20/84
4-SA-VO-15-44	82-345	17.8	ND (0.010)	ND (0.0006)	7/20/84
4-SA-VO-45+	82-346	11.6	Tr, 0.005 (0.004)	Tr, 0.0004 (0.0003)	7/20/84
1-ES-VO-0-14	82-319	25.6	ND (0.004)	ND (0.0002)	7/9/84
1-ES-VO-15-44	82-320	19.0	ND (0.004)	ND (0.0002)	7/9/84
1-ES-VO-45+	82-321	20.6	ND (0.006)	ND (0.0003)	7/9/84
2-ES-VO-15-44	82-338	24.3	0.052	0.0021	7/18/84
2-ES-VO-45+	82-339	19.3	0.15	0.008	7/20/84
1-WS-VO-0-14	82-322	6.0	ND (0.01)	ND (0.002)	7/11/84
1-WS-VO-15-44	82-323	22.4	ND (0.03)	ND (0.001)	7/11/84
1-WS-VO-45+	82-324	22.0	ND (0.008)	ND (0.0014)	7/11/84
2-WS-VO-15-44	82-340	21.9	ND (0.03)	ND (0.0004)	7/18/84

[a]ND - Not detected. Value in parentheses represents the estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).
[b]The sample analysis was repeated due to an interruption of the HRGC temperature program during the first analysis.

Table 17. Data Report - 1,2-Dichlorobenzene (CAS No. 95-50-1) - FY82 Composite Adipose Tissue Smples

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (µg)	Concentration - wet tissue (µg/g)	Analysis date
1-MO-VO-0-14	82-325	5.1	ND (0.001)[a]	ND (0.0002)	7/11/84
1-MO-VO-15-44	82-326	18.8	Tr, 0.015 (0.015)[c]	Tr, 0.0008	7/12/84
1-MO-VO-45+	82-327	22.4	Tr, 0.016 (0.015)[c]	Tr, 0.0007	7/12/84
1-NE-VO-0-14	82-304	20.0	Tr, 0.019 (0.015)[c]	Tr, 0.001	6/20/84
1-NE-VO-15-44	82-305	23.6	Tr, 0.020 (0.010)[c]	Tr, 0.001	6/21/84
1-NE-VO-45+	82-306	25.5	ND (0.010)	ND (0.0004)	6/21/84
1-PA-VO-0-14	82-301	15.0	Tr, 0.009 (0.005)	Tr, 0.0006	6/19/84
1-PA-VO-15-44	82-302	17.4	0.073	0.004	6/20/84
1-PA-VO-45+	82-303	20.7	Tr, 0.011 (0.010)[c]	Tr, 0.0005	6/20/84
1-MA-VO-0-14	82-307	20.3	Tr, 0.028 (0.015)[c]	Tr, 0.0014	6/27/84
1-MA-VO-15-44	82-308	25.0	Tr, 0.027 (0.010)[c]	Tr, 0.0011	6/27/84
1-MA-VO-45+	82-309	15.5	Tr, 0.022 (0.010)[c]	Tr, 0.0014	6/27/84
2-MA-0-14	82-328	18.1	Tr, 0.005 (0.005)[c]	Tr, 0.0003	7/12/84
2-MA-15-44	82-329	25.3	Tr, 0.035 (0.015)[c]	Tr, 0.0014	7/13/84
2-MA-VO-45+	82-330	17.8	Tr, 0.015 (0.010)[c]	Tr, 0.0008	7/13/84
1-EN-VO-0-14	82-310	12.7	0.081	0.0064	6/28/84
1-EN-VO-15-44	82-311	20.8	Tr, 0.020 (0.015)[c]	Tr, 0.001	6/28/84
1-EN-VO-45+	82-312	18.6	Tr, 0.017 (0.010)[c]	Tr, 0.0009	6/28/84
2-EN-VO-0-14	82-331	17.3	Tr, 0.011 (0.010)[c]	Tr, 0.0006	7/17/84
2-EN-VO-15-44	82-332	21.1	Tr, 0.020 (0.010)[c]	Tr, 0.0009	7/23/84
2-EN-VO-45+	82-333	22.6	ND (0.010)	ND (0.0004)	7/23/84
3-EN-VO-15-44	82-341	19.6	ND (0.002)	ND (0.0001)	7/18/84
3-EN-VO-45+	82-342	21.4	Tr, 0.018 (0.010)[c]	Tr, 0.0008	7/18/84
1-WN-VO-0-14	82-313	18.9	Tr, 0.007 (0.005)[c]	Tr, 0.0004	6/29/84
1-WN-VO-15-44	82-314	21.6	ND (0.010)	ND (0.0005)	6/29/84
1-WN-VO-45+	82-315	21.6	0.040	0.0019	7/2/84
2-WN-VO-45+	82-334	18.3	ND (0.011)	ND (0.0001)	7/16/84

Table 17 (concluded)

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-SA-VO-0-14	82-316	12.6	ND (0.010)	ND (0.0008)	7/3/84
1-SA-VO-15-44	82-317	22.2	ND (0.010)	ND (0.0005)	7/3/84
1-SA-VO-45+	82-318	15.4	ND (0.010)	ND (0.0007)	7/3/84
2-SA-VO-0-14	82-335	16.7	Tr, 0.017 (0.010)[c]	Tr, 0.001	7/17/84
2-SA-VO-15-44	82-336	18.7	Tr, 0.023 (0.010)[c]	Tr, 0.0012	7/17/84
2-SA-VO-45+	82-337	23.2	ND (0.010)	ND (0.0004)	7/17/84
3-SA-VO-15-44	82-343	10.1	ND (0.015)	ND (0.001)	7/20/84
3-SA-VO-45+	82-344	13.8	ND (0.001)	ND (0.0001)	7/20/84
4-SA-VO-15-44	82-345	17.8	ND (0.007)	ND (0.0004)	7/20/84
4-SA-VO-45+	82-346	11.6	ND (0.007)	ND (0.0006)	7/20/84
1-ES-VO-0-14	82-319	25.6	0.045	0.0018	7/9/84
1-ES-VO-15-44	82-320	19.0	ND (0.001)	ND (0.0001)	7/9/84
1-ES-VO-45+	82-321	20.6	Tr, 0.005 (0.005)[c]	Tr, 0.0002	7/9/84
2-ES-VO-15-44	82-338	24.3	Tr, 0.016 (0.010)[c]	Tr, 0.0007	7/18/84
2-ES-VO-45+	82-339	19.3	Tr, 0.005 (0.005)[c]	Tr, 0.0003	7/20/84
1-WS-VO-0-14	82-322	6.0	ND (0.004)	ND (0.0007)	7/11/84
1-WS-VO-15-44	82-323	22.4	Tr, 0.037 (0.020)[c]	Tr, 0.0017	7/11/84
1-WS-VO-45+	82-324	22.0	Tr, 0.022 (0.020)[c]	Tr, 0.001	7/11/84
2-WS-VO-15-44	82-340	21.9	ND (0.004)	ND (0.0002)	7/18/84

[a]ND - Not detected. Value in parentheses represents the estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).
[c]The value in parentheses is the estimated detection limit for this sample.

Table 18. Data Report - 1,4-Dichlorobenzene (CAS No. 106-46-7) - FY82 Composite Adipose Tissue Samples

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-MO-VO-0-14	82-325	5.1	0.091	0.018	7/11/84
1-MO-VO-15-44	82-326	18.8	1.1	0.059	7/12/84
1-MO-VO-45+	82-327	22.4	0.80	0.036	7/12/84
1-NE-VO-0-14	82-304	20.0	0.45	0.023	6/20/84
1-NE-VO-15-44	82-305	23.6	2.6	0.11	6/21/84
1-NE-VO-45+	82-306	25.5	0.30	0.012	6/21/84
1-PA-VO-0-14	82-301	15.0	1.7	0.11	6/19/84
1-PA-VO-15-44	82-302	17.4	0.29	0.017	6/20/84
1-PA-VO-45+	82-303	20.7	0.30	0.015	6/20/84
1-MA-VO-0-14	82-307	20.3	0.60	0.030	6/27/84
1-MA-VO-15-44	82-308	25.0	0.44	0.018	6/27/84
1-MA-VO-45+	82-309	15.5	0.91	0.059	6/27/84
2-MA-0-14	82-328	18.1	0.43	0.024	7/12/84
2-MA-15-44	82-329	25.3	8.2	0.32	7/13/84
2-MA-VO-45+	82-330	17.8	3.9	0.22	7/13/84
1-EN-VO-0-14	82-310	12.7	0.51	0.040	6/28/84
1-EN-VO-15-44	82-311	20.8	4.9	0.24	6/28/84
1-EN-VO-45+	82-312	18.6	2.1	0.10	6/28/84
2-EN-VO-0-14	82-331	17.3	1.5	0.087	7/17/84
2-EN-VO-15-44	82-332	21.1	2.2	0.10	7/23/84
2-EN-VO-45+	82-333	22.6	5.1	0.23	7/23/84
3-EN-VO-15-44	82-341	19.6	2.0	0.10	7/18/84
3-EN-VO-45+	82-342	21.4	2.3	0.10	7/18/84
1-WN-VO-0-14	82-313	18.9	1.1	0.058	6/29/84
1-WN-VO-15-44	82-314	21.6	0.48	0.022	6/29/84
1-WN-VO-45+	82-315	21.6	1.1	0.051	7/2/84
2-WN-VO-45+	82-334	18.3	0.30	0.016	7/16/84

Table 18 (concluded)

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (µg)	Concentration - wet tissue (µg/g)	Analysis date
1-SA-VO-0-14	82-316	12.6	1.2	0.095	7/3/84
1-SA-VO-15-44	82-317	22.2	1.3	0.059	7/3/84
1-SA-VO-45+	82-318	15.4	1.5	0.097	7/3/84
2-SA-VO-0-14	82-335	16.7	3.1	0.19	7/17/84
2-SA-VO-15-44	82-336	18.7	1.1	0.060	7/17/84
2-SA-VO-45+	82-337	23.2	3.9	0.17	7/17/84
3-SA-VO-15-44	82-343	10.1	3.5	0.35	7/20/84
3-SA-VO-45+	82-344	13.8	3.5	0.250	7/20/84
4-SA-VO-15-44	82-345	17.8	7.1	0.40	7/20/84
4-SA-VO-45+	82-346	11.6	0.19	0.016	7/20/84
1-ES-VO-0-14	82-319	25.6	4.6	0.18	7/9/84
1-ES-VO-15-44	82-320	19.0	0.76	0.040	7/9/84
1-ES-VO-45+	82-321	20.6	6.2	0.30	7/9/84
2-ES-VO-15-44	82-338	24.3	1.2	0.049	7/18/84
2-ES-VO-45+	82-339	19.3	6.2	0.32	7/20/84
1-WS-VO-0-14	82-322	6.0	2.1	0.35	7/11/84
1-WS-VO-15-44	82-323	22.4	2.6	0.12	7/11/84
1-WS-VO-45+	82-324	22.0	4.3	0.20	7/11/84
2-WS-VO-15-44	82-340	21.9	11	0.50	7/18/84

Table 19. Data Report - Ethyl Phenol (CAS No. 25429-37-2) - FY82 Composite Adipose Tissue Samples

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-MO-VO-0-14	82-325	5.1	1.4	0.27	7/11/84
1-MO-VO-15-44	82-326	18.8	1.2	0.064	7/12/84
1-MO-VO-45+	82-327	22.4	2.3	0.10	7/12/84
1-NE-VO-0-14	82-304	20.0	2.3	0.12	6/20/84
1-NE-VO-15-44	82-305	23.6	0.91, 4.2[a]	0.038, 0.17	6/21/84
1-NE-VO-45+	82-306	25.5	3.9	0.15	6/21/84
1-PA-VO-0-14	82-301	15.0	0.72	0.048	6/19/84
1-PA-VO-15-44	82-302	17.4	0.55	0.032	6/20/84
1-PA-VO-45+	82-303	20.7	0.35	0.017	6/20/84
1-MA-VO-0-14	82-307	20.3	0.42	0.021	6/27/84
1-MA-VO-15-44	82-308	25.0	1.7	0.066	6/27/84
1-MA-VO-45+	82-309	15.5	1.9	0.12	6/27/84
2-MA-0-14	82-328	18.1	0.85	0.047	7/12/84
2-MA-15-44	82-329	25.3	1.7	0.068	7/13/84
2-MA-VO-45+	82-330	17.8	0.56	0.031	7/13/84
1-EN-VO-0-14	82-310	12.7	1.2	0.091	6/28/84
1-EN-VO-15-44	82-311	20.8	0.81	0.039	6/28/84
1-EN-VO-45+	82-312	18.6	0.61	0.033	6/28/84
2-EN-VO-0-14	82-331	17.3	0.95	0.055	7/17/84
2-EN-VO-15-44	82-332	21.1	1.9	0.092	7/23/84
2-EN-VO-45+	82-333	22.6	0.18	0.008	7/23/84
3-EN-VO-15-44	82-341	19.6	0.20	0.010	7/18/84
3-EN-VO-45+	82-342	21.4	0.57	0.027	7/18/84
1-WN-VO-0-14	82-313	18.9	1.4	0.072	6/29/84
1-WN-VO-15-44	82-314	21.6	0.10	0.005	6/29/84
1-WN-VO-45+	82-315	21.6	Tr, 0.01[b] (0.005)[c]	Tr, 0.0004	7/2/84
2-WN-VO-45+	82-334	18.3	0.12	0.007	7/16/84

Table 19 (concluded)

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-SA-VO-0-14	82-316	12.6	4.7	0.37	7/3/84
1-SA-VO-15-44	82-317	22.2	0.82	0.037	7/3/84
1-SA-VO-45+	82-318	15.4	0.86	0.056	7/3/84
2-SA-VO-0-14	82-335	16.7	3.4	0.20	7/17/84
2-SA-VO-15-44	82-336	18.7	0.98	0.052	7/17/84
2-SA-VO-45+	82-337	23.2	0.28	0.012	7/17/84
3-SA-VO-15-44	82-343	10.1	0.77	0.076	7/20/84
3-SA-VO-45+	82-344	13.8	0.74	0.054	7/20/84
4-SA-VO-15-44	82-345	17.8	1.1	0.063	7/20/84
4-SA-VO-45+	82-346	11.6	0.38	0.033	7/20/84
1-ES-VO-0-14	82-319	25.6	1.3	0.050	7/9/84
1-ES-VO-15-44	82-320	19.0	0.32	0.017	7/9/84
1-ES-VO-45+	82-321	20.6	0.82	0.040	7/9/84
2-ES-VO-15-44	82-338	24.3	0.19	0.008	7/18/84
2-ES-VO-45+	82-339	19.3	0.56	0.029	7/20/84
1-WS-VO-0-14	82-322	6.0	2.4	0.40	7/11/84
1-WS-VO-15-44	82-323	22.4	3.0	0.14	7/11/84
1-WS-VO-45+	82-324	22.0	0.96	0.044	7/11/84
2-WS-VO-15-44	82-340	21.9	0.28	0.013	7/18/84

[a]The sample analysis was repeated due to an interruption of the HRGC temperature program during the first analysis.
[b]Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).
[c]The value in paretheses is the estimated detection limit for this sample.

Table 20. Data Report - Xylene (CAS No. 1330-20-7) - FY82 Composite Adipose Tissue Samples[a]

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-MO-VO-0-14	82-325	5.1	0.62	0.12	7/11/84
1-MO-VO-15-44	82-326	18.8	2.0	0.11	7/12/84
1-MO-VO-45+	82-327	22.4	3.4	0.15	7/12/84
1-NE-VO-0-14	82-304	20.0	3.8	0.19	6/20/84
1-NE-VO-15-44	82-305	23.6	8.2, 11[b]	0.35, 0.48	6/21/84
1-NE-VO-45+	82-306	25.5	9.7	0.38	6/21/84
1-PA-VO-0-14	82-301	15.0	0.35	0.024	6/19/84
1-PA-VO-15-44	82-302	17.4	0.81	0.046	6/20/84
1-PA-VO-45+	82-303	20.7	0.62	0.030	6/20/84
1-MA-VO-0-14	82-307	20.3	0.39	0.019	6/27/84
1-MA-VO-15-44	82-308	25.0	1.4	0.057	6/27/84
1-MA-VO-45+	82-309	15.5	0.84	0.054	6/27/84
2-MA-0-14	82-328	18.1	0.50	0.028	7/12/84
2-MA-15-44	82-329	25.3	1.3	0.052	7/13/84
2-MA-VO-45+	82-330	17.8	0.73	0.041	7/13/84
1-EN-VO-0-14	82-310	12.7	7.8	0.61	6/28/84
1-EN-VO-15-44	82-311	20.8	11	0.51	6/28/84
1-EN-VO-45+	82-312	18.6	4.5	0.24	6/28/84
2-EN-VO-0-14	82-331	17.3	4.7	0.27	7/17/84
2-EN-VO-15-44	82-332	21.1	3.5	0.20	7/23/84
2-EN-VO-45+	82-333	22.6	5.7	0.25	7/23/84
3-EN-VO-15-44	82-341	19.6	2.7	0.14	7/18/84
3-EN-VO-45+	82-342	21.4	4.8	0.23	7/18/84
1-WN-VO-0-14	82-313	18.9	1.5	0.079	6/29/84
1-WN-VO-15-44	82-314	21.6	1.7	0.081	6/29/84
1-WN-VO-45+	82-315	21.6	0.59	0.027	7/2/84
2-WN-VO-45+	82-334	18.3	1.5	0.081	7/16/84

Table 20 (concluded)

Sample composite number	MRI sample number	Wet tissue weight (g)	Total mass detected (μg)	Concentration - wet tissue (μg/g)	Analysis date
1-SA-VO-0-14	82-316	12.6	3.6	0.29	7/3/84
1-SA-VO-15-44	82-317	22.2	12	0.53	7/3/84
1-SA-VO-45+	82-318	15.4	8.0	0.52	7/3/84
2-SA-VO-0-14	82-335	16.7	3.8	0.23	7/17/84
2-SA-VO-15-44	82-336	18.7	6.9	0.37	7/17/84
2-SA-VO-45+	82-337	23.2	7.2	0.31	7/17/84
3-SA-VO-15-44	82-343	10.1	9.3	0.92	7/20/84
3-SA-VO-45+	82-344	13.8	8.8	0.64	7/20/84
4-SA-VO-15-44	82-345	17.8	6.8	0.38	7/20/84
4-SA-VO-45+	82-346	11.6	0.21	0.018	7/20/84
1-ES-VO-0-14	82-319	25.6	1.3	0.049	7/9/84
1-ES-VO-15-44	82-320	19.0	1.1	0.056	7/9/84
1-ES-VO-45+	82-321	20.6	1.2	0.057	7/9/84
2-ES-VO-15-44	82-338	24.3	1.3	0.055	7/18/84
2-ES-VO-45+	82-339	19.3	1.2	0.060	7/20/84
1-WS-VO-0-14	82-322	6.0	8.6	1.4	7/11/84
1-WS-VO-15-44	82-323	22.4	25	1.1	7/11/84
1-WS-VO-45+	82-324	22.0	18	0.81	7/11/84
2-WS-VO-15-44	82-340	21.9	7.8	0.36	7/18/84

[a]The data indicated the presence of two of the possible three xylene isomers, however, the specific compounds were not determined.
[b]The sample analysis was repeated due to an interruption of the HRGC temperature program during the first analysis.

Table 21. Incidence of Detection of Selected Volatile Organic Compounds in the NHATS FY82 Composite Samples

Compound	Frequency of observation (%)
Chloroform	76
1,1,1-Trichloroethane	48
Bromodichloromethane	0
Benzene	96
Tetrachloroethene	61
Dibromochloromethane	0
1,1,2-Trichloroethane	0
Toluene	91
Chlorobenzene	96
Ethylbenzene	96
Bromoform	0
Styrene	100
1,1,2,2-Tetrachloroethane	9
1,2-Dichlorobenzene	63
1,4-Dichlorobenzene	100
Xylene	100
Ethylphenol	100

V. QUALITY ASSURANCE/QUALITY CONTROL

As mentioned in Section IV, several procedures were included with the analysis of the composite specimens to document the quality of the data reported. These procedures included instrument performance checks using reagent spikes at the purge tower. These were performed daily following initial instrument calibration by the HRGC/MS analyst. The quality control procedures also required that the analyst demonstrate background contribution of the headspace analysis system through the analysis of system blanks. Adipose tissue samples were spiked with known amounts of the target analytes and internal standards to verify consistency of response factors before proceeding with the sample analyses. When necessary, the analyst completed the analysis of a three-point calibration curve before proceeding with sample analysis. Typical spike levels of the target analyte ranged from 0.2 to 1.4 µg per 20-g aliquot of tissue. These spike levels were equivalent to concentrations from 0.010 to 0.070 µg/g.

A. Instrument Performance Checks

Instrument performance checks were completed using quality control samples prepared by the MS analyst (internal QC) or by the project quality control coordinator (external QC). These instrument performance checks were completed to demonstrate that the HRGC/MS system was properly calibrated and to document method performance (precision) over time. The instrument performance checks were achieved by spiking a solution of the reference compounds into the purge tower and then proceeding with the sampling and analyses events as described earlier in the experimental section.

1. Internal QC

Table 22 presents a summary of the internal QC instrumental performance check completed for 10 different analysis days. Spike levels for these instrument performance checks were from 0.20 to 0.40 µg for each of the specified target analytes. Table 23 provides the average recovery and range of measured recoveries for each compound. As noted, the method recoveries for all compounds were typically within the range of 80 to 120% with the exception of bromochloromethane. The method precision for the internal QC measurements was generally within ± 15%. These accuracy and precision estimates reflect day-to-day performance of the analytical method.

2. External QC

A mixed volatile stock standard was prepared containing chloroform, benzene, bromodichloromethane, toluene, chlorobenzene, ethylbenzene, 1,2-dichlorobenzene, 1,1,2,2-tetrachloroethane, and tetrachloroethene at a concentration of 10 mg/mL for each compound. One portion of the stock solution was diluted and used for internal QC, and another was diluted and used for performance audit samples.

Five dilutions of the stock solution were prepared in tetraglyme, sealed in microreaction vials sealed with Mininert valves, and stored in a freezer until needed. The concentration of each compound per dilution was:

Audit sample no.	Concentration
VOA 1	0.41 μg/μL
VOA 2	0.80 μg/μL
VOA 3	0.80 μg/μL
VOA 4	0.68 μg/μL
VOA 5	0.81 μg/μL

The results of the QC performance audit samples are found in Table 24.

B. Spiked Adipose Tissue Samples

An additional QC control check included the analysis of spiked adipose tissue samples. Table 25 summarizes the results for five spiked adipose tissue specimens analyzed with the first sample batches. The mean accuracy of these measurements ranged from 94% for 1,1,2-trichloroethane to 141% for 1,1,2,2-tetrachloroethane. The range of recoveries for each compound is somewhat broader than noted for the instrument performance checks due to the influence of the matrix on recovery efficiency and background contribution.

C. Internal Standards

The absolute responses of the internal standards were noted for each QC check sample and composite adipose tissue sample to document instrument operating parameters. The absolute responses of the internal standards in the first composite sample analyzed were observed to decrease markedly in comparison to the responses observed for the instrument performance check and system blank. A reduction in the response can be attributed to the adipose tissue matrix. Obviously, the presence of oily lipid materials affects the aqueous to air partitioning of the volatile internal standards.

Differences in the recovery of the internal standard from the FY82 composite specimens and the bulk adipose tissues used for method calibration were also observed. The absolute responses of the internal standards from the bulk adipose tissue samples were nearly always greater than the responses for the NHATS composites. This indicates that the recoveries or observed partitioning of the internal standards from the spiked samples to the headspace was greater for the QC samples than the FY82 composites. This observed recovery might indicate some difference in the two sources of adipose tissues. This bulk adipose tissue had been collected within 6 mo of the volatile organic analysis as compared with the FY82 specimens, which had been stored for up to 2 yr.

After observing the reduction in response with the first composite sample, the instrument performance was verified through reanalysis of a vessel blank (water plus internal standards). This analysis demonstrated that the instrument was properly calibrated and that the matrix was responsible for the reduction in response of the internal standards.

Figures 22 to 25 are plots of several of the internal standard responses from the system blanks, spiked reference tissue samples, and NHATS composite samples. These plots demonstrate that the differences in the observed internal standards responses for the method blanks, spiked reference tissues, and the NHATS composites were noted for each day that the composites were analyzed.

Table 22. Summary of the Internal QC Instrument Performance Checks for Selected Volatile Organic Analytes[a]

Date of analysis	6/20/84		6/21/84		6/26/84		7/2/84		7/9/84	
	Total µg	% Recovery	Total µg	% Recovery	Total µg	% Recovery	Total µg	% Recovery	Total µg	% Recovery
Compound										
1,1,1-Trichloroethane	0.44	110	ND	-	0.18	90	0.22	110	0.25	125
Bromodichloroethane	0.37	93	0.27	135	0.1	50	0.56	280	0.39	195
Benzene	0.37	93	0.20	100	0.20	100	0.19	95	0.20	100
Tetrachloroethene	0.35	88	0.18	90	0.19	95	0.19	95	0.23	115
Dibromochloroethane	0.39	98	0.19	95	0.19	95	0.19	95	0.18	90
1,1,2-Trichloroethane	0.40	100	0.18	90	0.21	105	0.29	100	0.19	95
Toluene	0.43	110	0.17	88	0.20	100	0.19	95	0.19	95
Chlorobenzene	0.46	120	0.21	105	0.20	100	0.21	105	0.20	100
Ethylbenzene	0.41	100	0.20	100	0.20	100	0.19	95	0.20	100
Bromoform	0.41	100	0.17	85	0.20	100	0.17	85	0.16	80
Styrene	0.38	95	0.19	95	0.20	100	0.18	90	0.18	90
1,1,2,2-Tetrachloroethane	0.38	95	0.20	100	0.19	95	22	110	0.16	80
1,2-Dichlorobenzene	0.38	95	0.19	95	0.21	105	0.18	90	ND	-

Date of analysis	7/10/84		7/11/84		7/13/84		7/17/84		7/18/84	
	Total µg	% Recovery	Total µg	% Recovery	Total µg	% Recovery	Total µg	% Recovery	Total µg	% Recovery
Compound										
1,1,1-Trichloroethane	0.21	105	0.19	95	0.20	100	0.24	120	0.19	95
Bromochloromethane	0.18	90	0.14	70	0.29	150	0.15	75	0.14	70
Benzene	0.21	105	0.21	105	0.18	90	0.19	95	0.20	100
Tetrachloroethene	0.21	105	0.19	95	0.19	95	0.21	105	0.22	110
Dibromochloromethane	0.20	100	0.21	105	0.18	90	0.22	110	0.21	105
1,1,2-Trichloroethane	0.20	100	0.21	105	0.20	100	0.21	105	0.22	110
Toluene	0.23	115	0.20	100	0.18	90	0.23	120	0.24	120
Chlorobenzene	0.20	100	0.20	100	0.19	95	0.21	105	0.20	100
Ethylbenzene	0.22	110	0.20	100	0.18	90	0.20	100	0.21	105
Bromoform	0.20	100	0.22	110	0.23	115	0.22	110	0.22	110
Styrene	0.20	100	0.21	105	0.28	140	0.22	110	0.21	105
1,1,2,2-Tetrachloroethane	0.21	105	0.21	105	0.22	110	0.22	110	0.20	100
1,2-Dichlorobenzene	0.21	105	0.21	105	0.22	110	0.23	115	0.20	100

[a]These QC samples were analyzed along with the actual composited FY82 specimens. The spiked samples were prepared by the MS analyst.
[b]Values in parentheses reflect the concentration or recovery based on the isotope dilution principle using the deuterated analog of the specific compound. All other calculations are versus the internal standard bromochloropropane.

Table 23. Average Recovery for Internal QC Instrument Performance Checks[a]

Compound	Average recovery (%)	Range (%)
1,1,1-Trichloroethane	105 ± 11.8	90-125
Bromochloromethane	121 ± 71	50-280
Benzene	98.3 ± 4.9	90-105
Tetrachloroethene	99.3 ± 8.9	88-115
Dibromochloromethane	98.8 ± 6.1	90-110
1,1,2-Trichloroethane	101 ± 5.7	90-110
Toluene	103 ± 12.1	88-120
Chlorobenzene	103 ± 6.7	95-120
Ethylbenzene	100 ± 5.3	90-110
Bromoform	99.5 ± 12.3	80-115
Styrene	103 ± 14.6	90-140
1,1,2,2-Tetrachloroethane	101 ± 9.4	80-110
1,2-Dichlorobenzene	102 ± 7.9	90-115

[a]These data were summarized to include accuracy for isotope dilution measurements where possible.

Table 24. Summary of Results - QC Performance Audit Samples

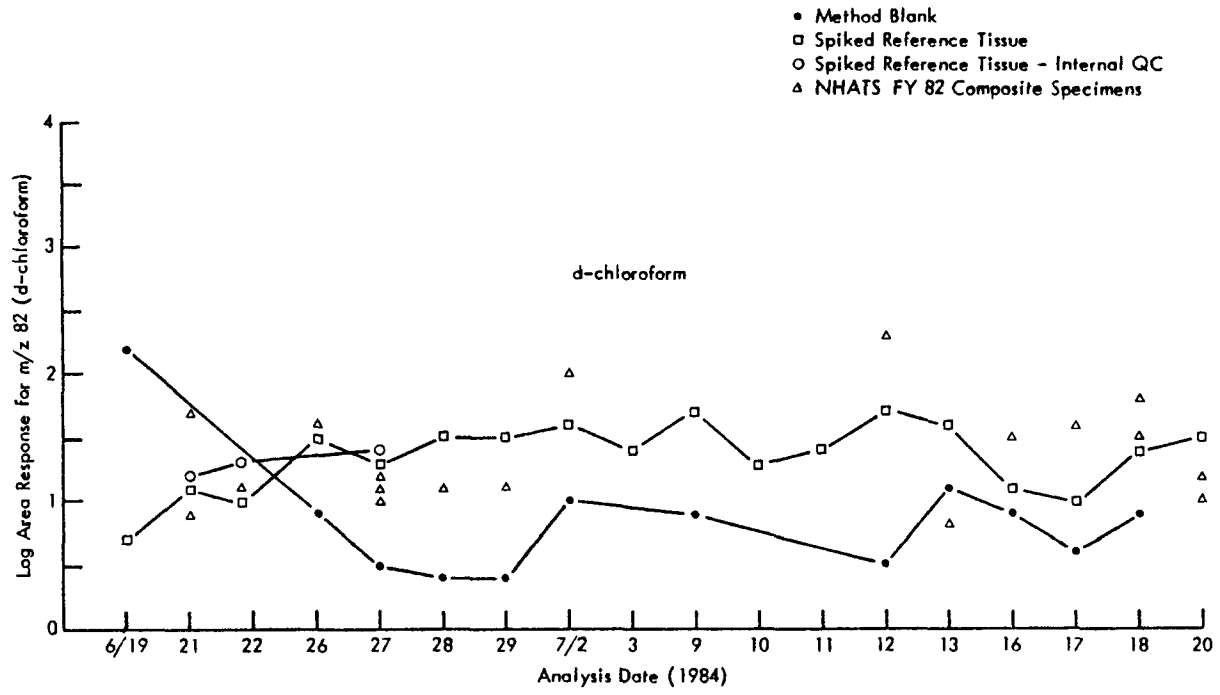
Compound	VOA-1 6/19/84		VOA-2 6/25/85		VOA-3 6/26/84		VOA-4 7/02/84		VOA-4 7/03/84		VOA-5 7/09/84	
	µg	%	µg	%	µg	%	µg	%	µg	%	µg	%
Chloroform	0.54	132	0.43	53	0.91	114	0.59	36	0.71	105	0.83	103
Bromodichloromethane	0.38	93	0.42	53	0.86	108	0.44	65	0.24	37	0.75	93
Benzene	0.38	94	0.73	92	0.90	112	0.70	103	1.82	268	0.88	109
Tetrachloroethene	0.40	98	0.64	80	0.78	98	0.66	97	0.68	100	0.71	88
Toluene	0.36	89	0.56	70	0.62	78	0.60	88	0.63	93	0.70	87
Chlorobenzene	0.37	91	0.76	95	0.67	84	0.66	97	0.70	103	0.84	104
Ethylbenzene	0.39	90	0.80	111	0.83	103	0.76	112	0.72	106	0.86	106
1,1,2,2-Tetrachloro-ethane	0.37	90	0.63	78	0.60	75	0.60	88	0.61	90	0.56	70
1,2-dichlorobenzene	0.37	90	0.69	87	0.71	88	0.79	116	0.64	94	0.74	91

Compound	VOA-5 6/19/84		VOA-5 6/25/85		VOA-4 6/26/84	
	µg	%	µg	%	µg	%
Chloroform	0.53	65	0.69	86	0.41	60
Bromodichloromethane	0.30	37	0.55	68	0.26	38
Benzene	0.86	106	0.82	102	0.69	102
Tetrachloroethene	0.85	105	0.72	89	0.64	94
Toluene	0.86	106	0.54	67	0.41	61
Chlorobenzene	0.81	100	0.65	80	0.63	93
Ethylbenzene	0.82	101	0.74	92	0.73	107
1,1,2,2-tetrachloro-ethane	0.81	100	0.62	77	0.62	92
1,2-dichlorobenzene	0.81	100	0.71	87	0.57	84

Table 25. Summary of Method Recovery (%) of Selected Volatile Organic Analytes Spiked into 20-g Aliquots of Human Adipose Tissue - Internal QC

	6/21/84		6/26/84		6/27/84		6/28/84		6/29/84	
	Total µg	% Recovery[b]	Total µg	% Recovery	Total µg	% Recovery	Total µg	% Recovery	Total µg	% Recovery
Chloroform	ND	-	0.22	110	0.15	75	0.19	95	ND	-
1,1,1-Trichloroethane	0.15	75	0.16	80	0.44	220	0.30	150	0.26	130
Bromodichloromethane	0.22	110	0.40	200	0.21	105	0.06	30	0.21	110
Benzene	0.21	105	0.20	100	0.20	100	0.26	130	0.19	95
Tetrachloroethene	0.41	205	0.17	85	0.14	70	0.20	100	0.30	150
Dibromochloromethane	0.19	95	0.20	100	0.29	145	0.21	105	0.22	110
1,1,2-Trichloroethane	0.16	80	0.20	100	0.20	100	0.18	90	0.20	100
Toluene	0.20	100	0.19	95	0.15	75	0.27	140	0.15	75
Chlorobenzene	0.28	140	0.17	85	0.19	95	0.21	105	0.19	95
Ethylbenzene	0.20	100	0.24	120	0.20	100	0.22	110	0.19	95
Bromoform	0.16	80	0.18	90	0.24	120	0.26	130	0.15	75
Styrene	0.17	85	0.21	105	0.41	205	0.46	230	0.16	80
1,1,2,2-Tetrachloroethane	0.20	100	0.21	105	0.22	110	0.22	110	0.18	90
1,2-Dichlorobenzene	0.21	105	0.22	110	0.47	235	0.19	95	ND	-

[a]These QC samples were analyzed along with the actual composited FY82 specimens. The spiked samples were prepared by the MS analyst.
[b]The % recovery reflects accuracy.



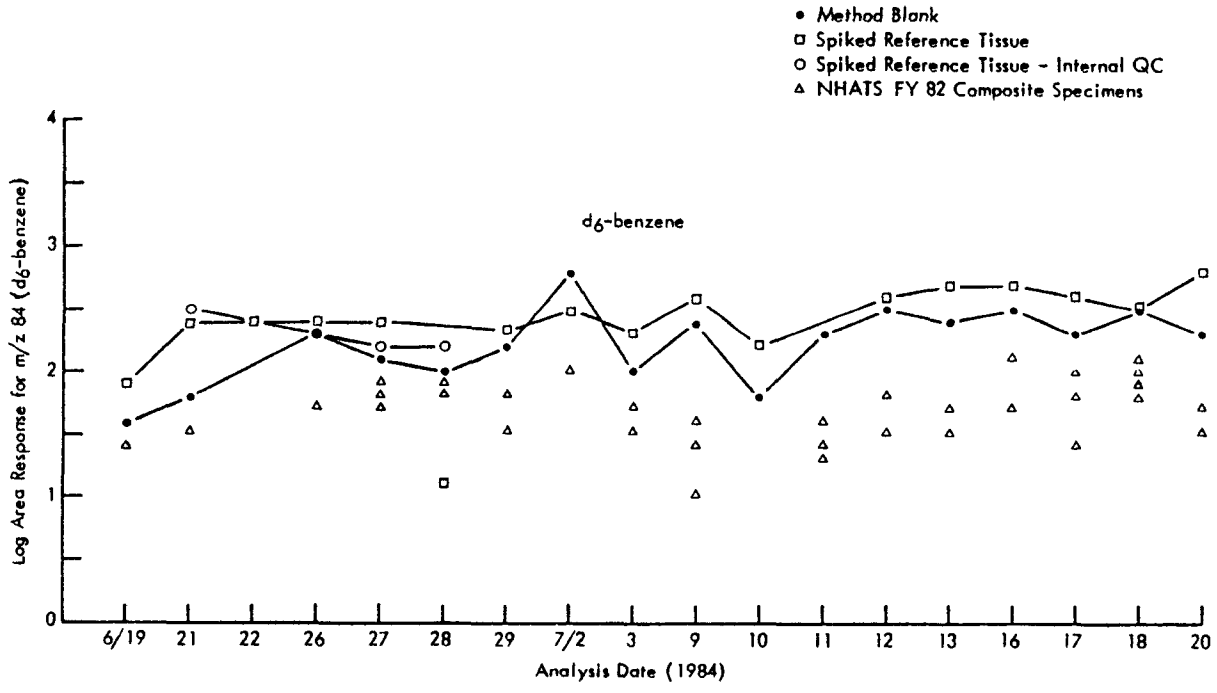
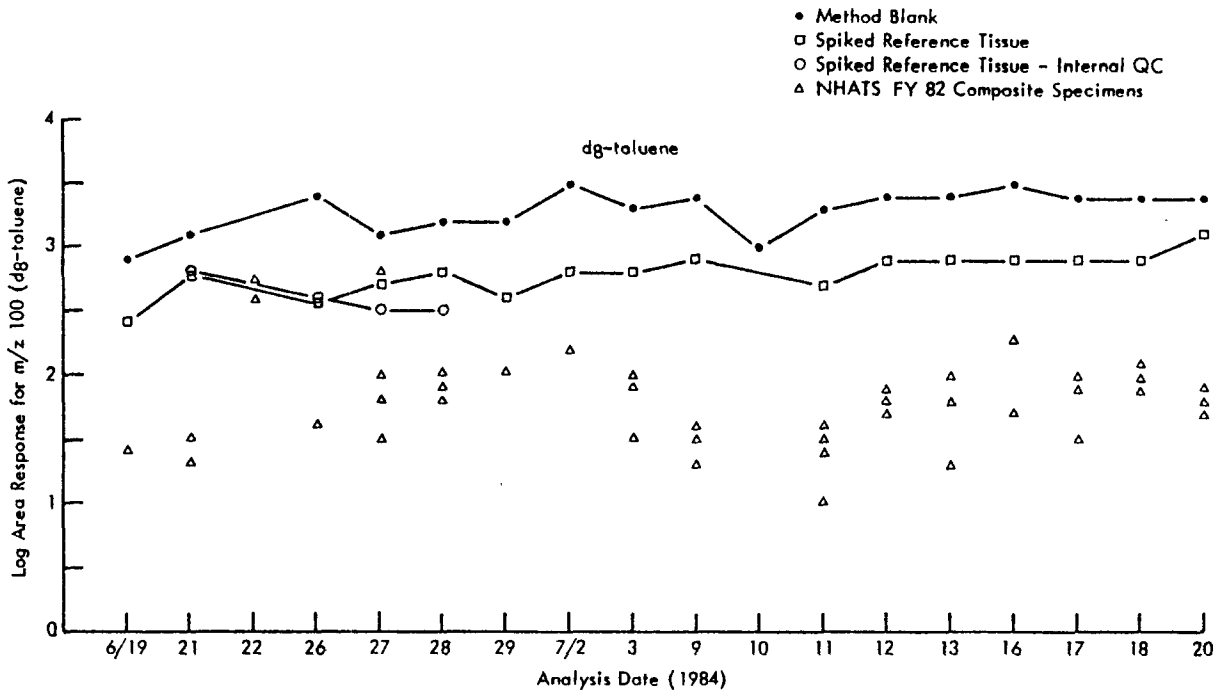


Figure 22. Observed HRGC/MS responses for the internal standards d-chloroform and d_6-benzene, from method blanks, spiked tissue samples and the NHATS composite samples.



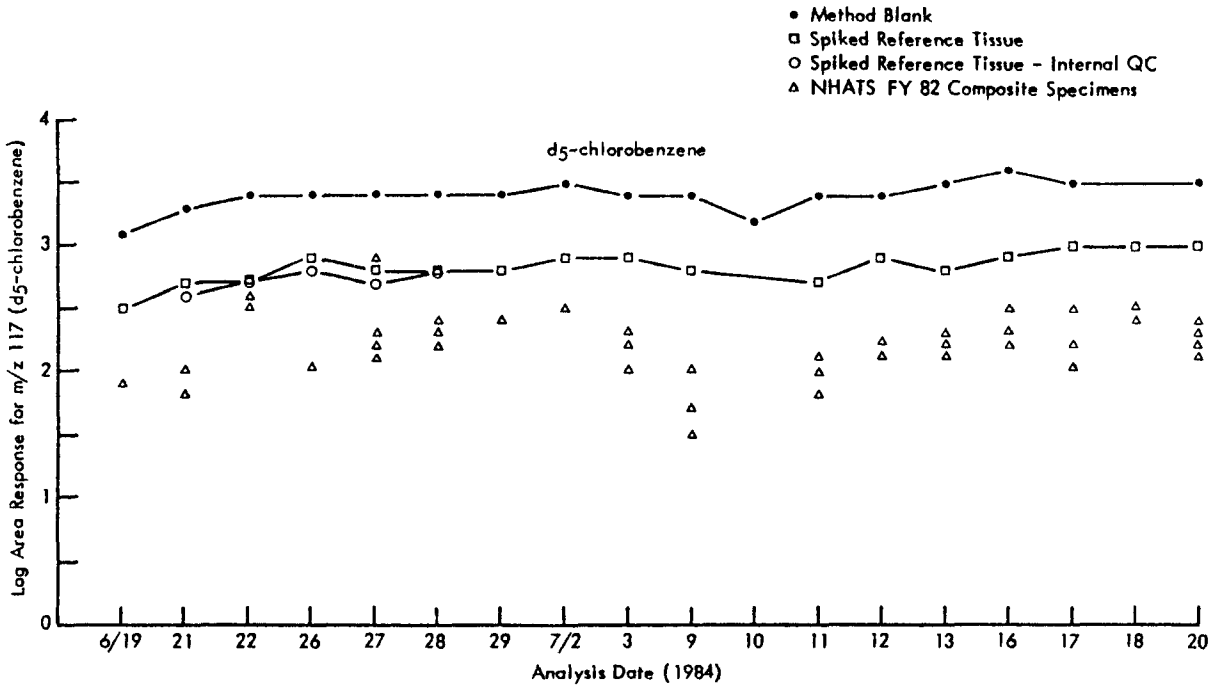


Figure 23. Observed HRGC/MS responses for the internal standards d_8-toluene and d_5-chlorobenzene, from method blanks, spiked tissue samples and the NHATS composite samples.

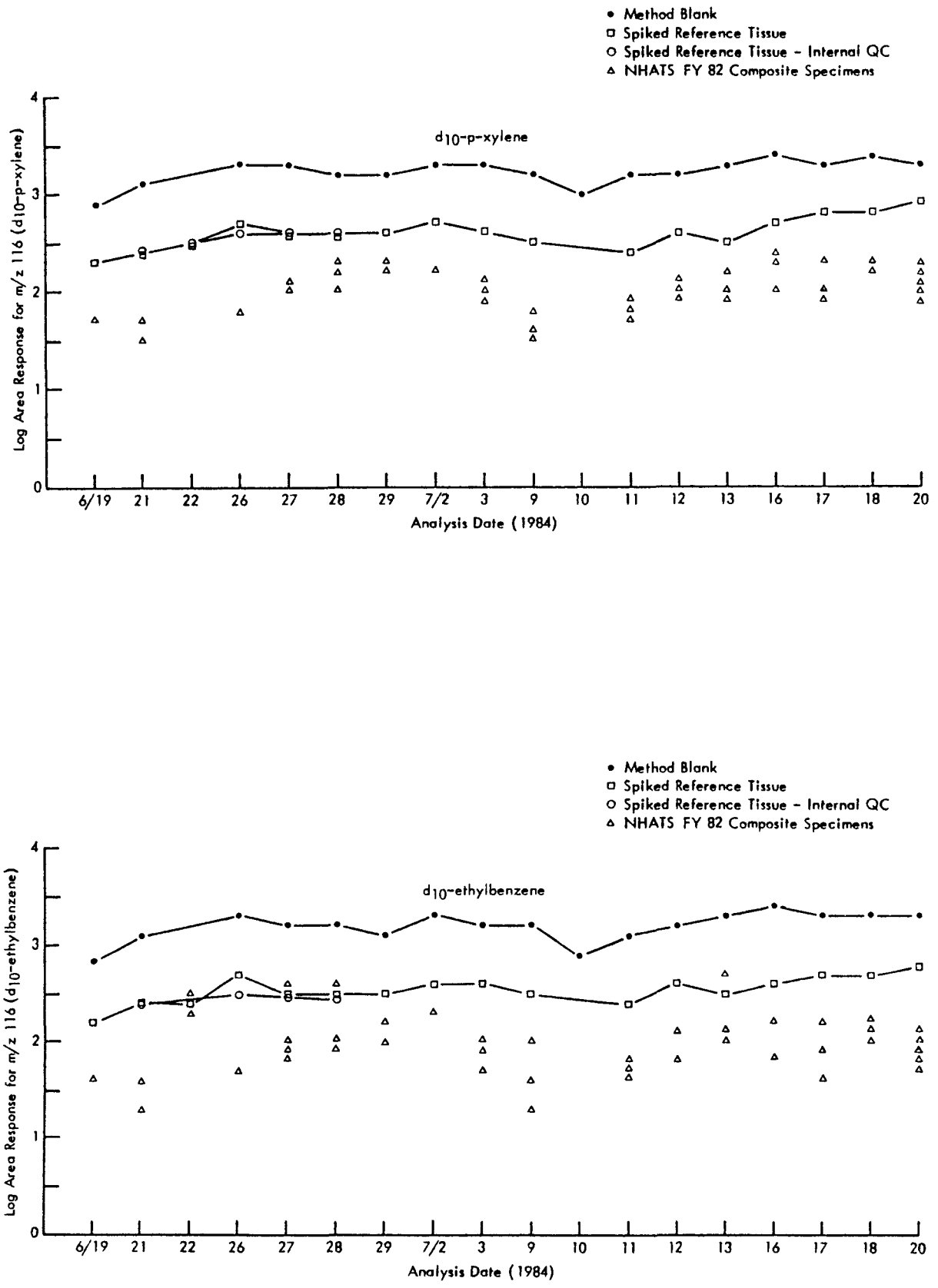
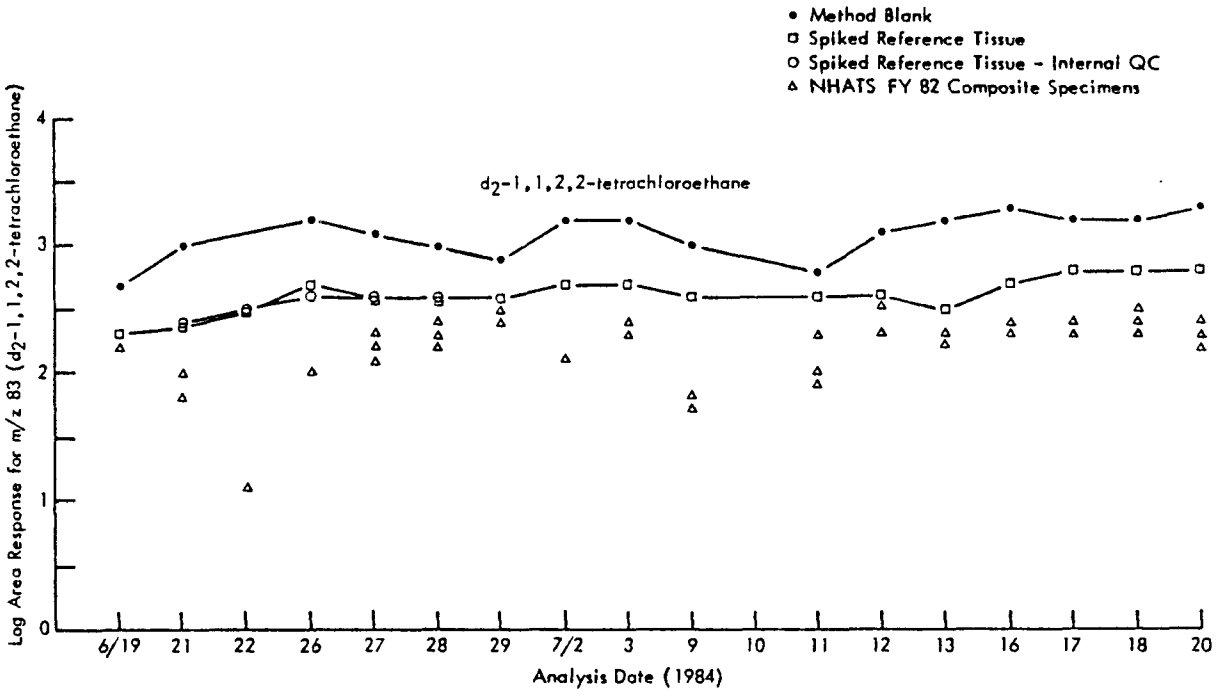


Figure 24. Observed HRGC/MS responses for the internal standards d_{10}-p-xylene and d_{10}-ethylbenzene, from method blanks, spiked tissue samples and the NHATS composite samples.



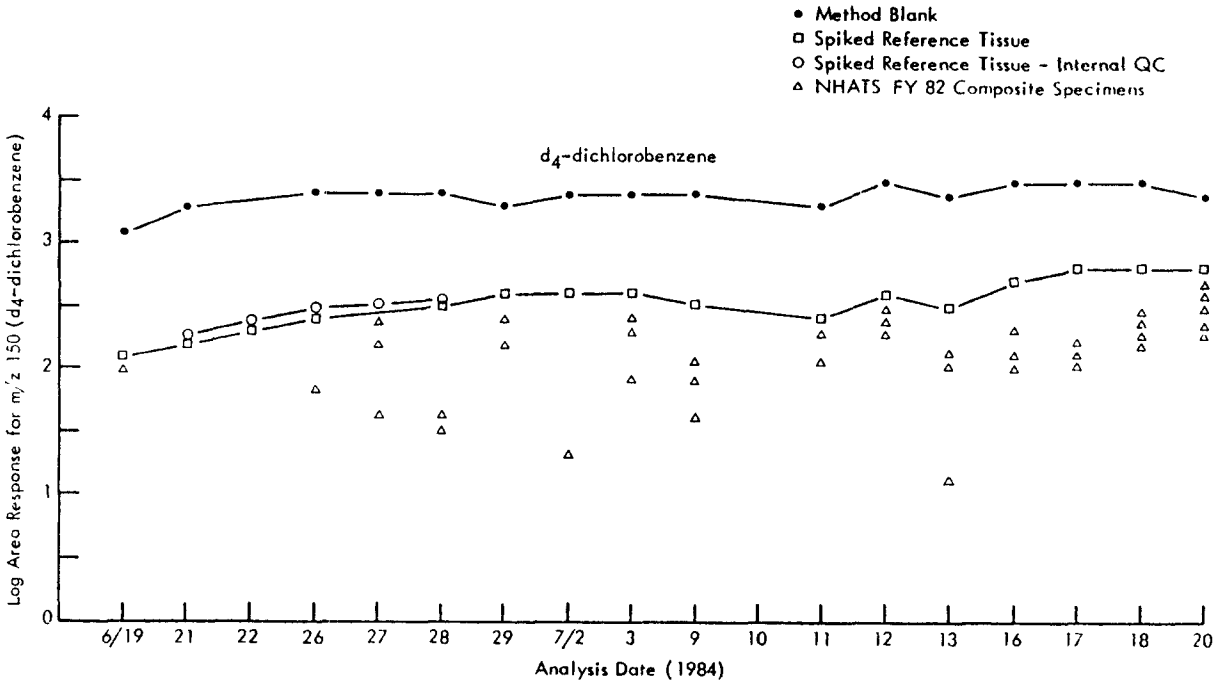


Figure 25. Observed HRGC/MS responses for the internal standards d_2-1,1,2,2-tetrachloroethane and d_4-dichlorobenzene, from method blanks, spiked tissue samples and the NHATS composite samples.

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APPENDIX A

ANALYTICAL METHOD FOR THE DETERMINATION OF VOLATILE ORGANIC COMPOUNDS IN HUMAN ADIPOSE TISSUE

ANALYTICAL METHOD FOR THE DETERMINATION OF VOLATILE ORGANIC COMPOUNDS IN HUMAN ADIPOSE TISSUE

1.0 SCOPE AND APPLICATION

1.1 This method covers the determination of volatile organic compounds in human adipose tissue. The following compounds have been evaluated and determined by this method.

Compound	CAS no.
Chloroform	67-66-3
1,1,1-Trichloroethane	71-55-6
Bromodichloromethane	75-27-4
Benzene	71-43-2
Tetrachloroethene	127-18-4
Dibromochloromethane	124-48-1
1,1,2-Trichloroethane	79-00-5
Toluene	108-88-3
Chlorobenzene	108-90-7
Ethylbenzene	100-41-4
Bromoform	75-25-2
Styrene	100-42-5
1,1,2,2-Tetrachloroethane	79-34-5
1,2-Dichlorobenzene	95-50-1
1,4-Dichlorobenzene	106-46-7
Ethyl phenol	25429-37-2
Xylene	1330-20-7

1.2 This is a dynamic headspace high resolution gas chromatography/mass spectrometry (HRGC/MS) method applicable to the determination of volatile organic compounds in human adipose tissue.

1.3 The method detection limit (MDL) for each parameter is estimated to range from 0.001-0.10 μg/g for a 20-g sample. The MDL for a specific sample of human adipose tissue may differ depending upon the nature of interferences in the sample matrix and the specific analyte determined.

2.0 METHOD SUMMARY

Helium gas is swept through the head space of a specially designed purging chamber containing water and the adipose tissue sample. The water and sample are heated and stirred to aid in the efficient transfer of the analytes from the adipose tissue and water mixture to the gaseous phase. The vapor is swept through a cooling tower at ambient temperature to remove excess water vapor and onto a Tenax sorbent trap where the volatile analytes are captured. After the sampling is complete, the sorbent trap is heated and backflushed with helium to desorb

the analytes onto a HRGC column. The gas chromatograph is temperature programmed to separate the compounds which are then detected by the mass spectrometer. Figure A-1 provides a schematic of the dynamic headspace purge and trap HRGC/MS analysis system.

3.0 CONTAMINATION AND INTERFERENCES

3.1 Impurities in the purge gas, organic compounds out-gassing from the plumbing upstream of the trap, and solvent vapors in the laboratory account for the majority of contamination problems. The analytical system is demonstrated to be free from interferences under conditions of the analysis by analyzing blanks initially and with each sample set analyzed daily.

3.2 Samples can be contaminated by diffusion of volatile organic compounds through the bottle seal during preparation, handling, or storage. A sample container blank carried through the sampling and handling protocol serves as a check on such contamination.

3.3 Contamination by carry-over can occur when high level and low level samples are analyzed sequentially. To reduce carry-over, a clean headspace chamber is used for each sample analysis and sample syringes are rinsed between samples with reagent water. Instrument performance checks and QC samples are followed by analysis of a reagent water blank to check for carry-over. The headspace device is washed with soap solution, rinsed with tap and distilled water, and dried in an oven at 100-125°C overnight. The Tenax adsorbent trap and other parts of the system are also subject to contamination; therefore, frequent bakeout and purging of the entire system may be required.

3.4 Interferences resulting from samples may vary considerably, depending on the length of sample storage.

4.0 SAFETY

4.1 The toxicity or carcinogenicity of each compound used in this method has not been precisely defined; however, each compound should be treated as a potential health hazard. Exposure to these chemicals should be maintained at the lowest possible level.

4.2 The glass purging apparatus used in this method is of fairly recent design and has apparent limitations which must be observed. The pressure in the system should not exceed 10 psi. Excessive pressure above this limit may result in the possible explosion of the purging vessel or purge tower. Monitoring the gas pressure is easily accomplished by placing a pressure gauge between the helium source and the gas inlet at the vessel. At no time should any glassware be pressurized without the analyst wearing approved safety goggles.

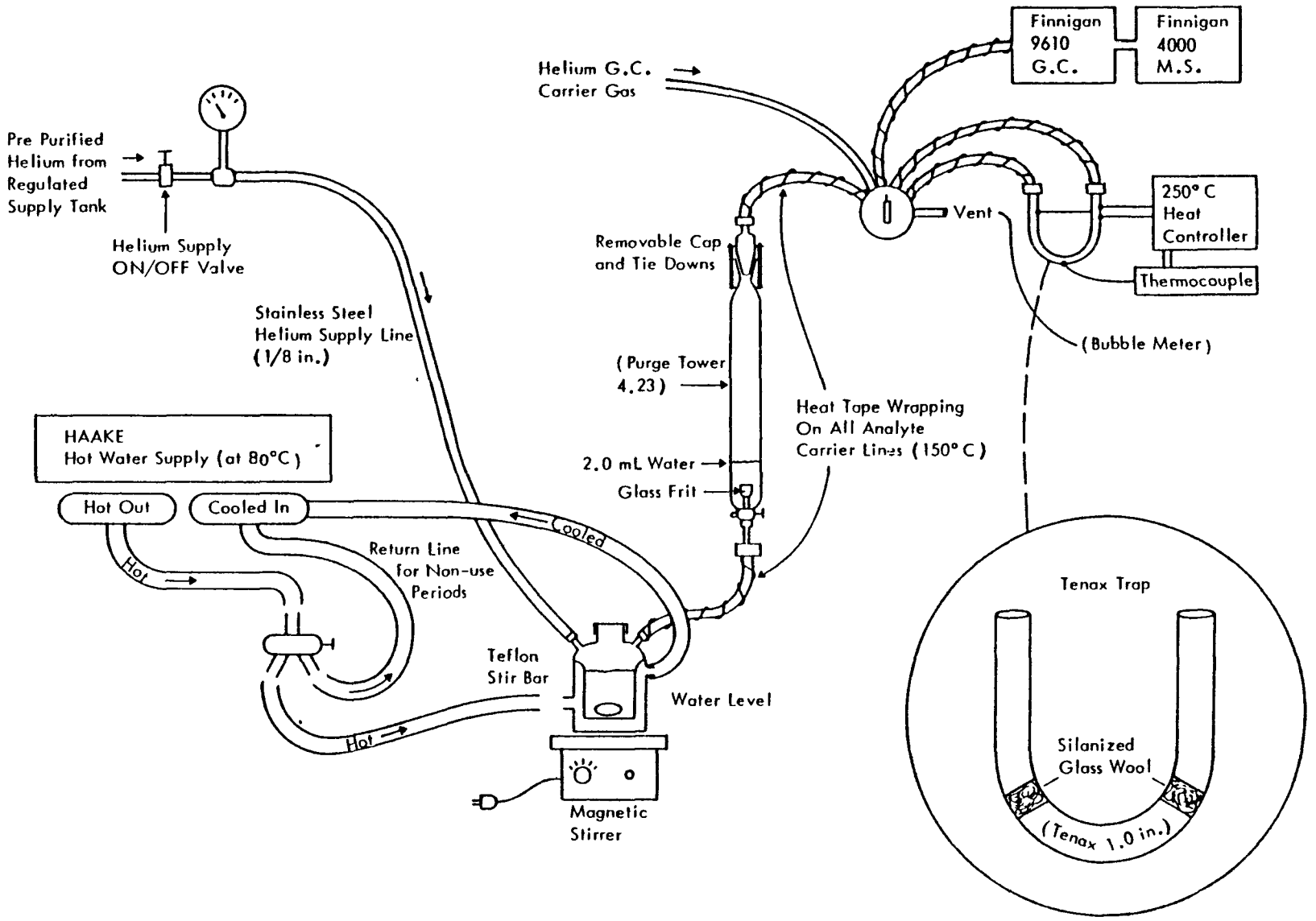

Figure A-1. Schematic of the dynamic headspace purge and trap HRGC/MS analysis system.

5.0 APPARATUS AND MATERIALS

5.1 Gas pressure gauge - Supelco No. 2-0392 or equivalent.

5.2 Spatulas, stainless steel - Fisher No. 14-375-10.

5.3 Volumetric flask - 10.0 mL - Ace No. 7100-02.

5.4 Syringes

5.4.1 Syringe - 10.0 mL - Hamilton No. 1010.

5.4.2 Syringe - 1.0 mL - Hamilton No. 1001.

5.4.3 Syringe - 100.0 µL - Hamilton No. 710N.

5.4.4 Syringe - 25.0 µL - Hamilton No. 702N.

5.4.5 Syringe - 2 x 5.0 µL - Hamilton No. 75N.

5.5 Vials - 2 x 5.0 mL microreaction vessels - Supelco No. 3-3298.

5.6 Vials - 2 x 1.0 mL microreaction vessels - Supelco No. 3-3292.

5.7 Mininert valves - (x2) - Supelco No. 3-3301.

5.8 Teflon® tubing (1/8-in. ID) - Ace No. 12687-08.

5.9 Funnel (1.0 L) - Ace No. 7249-40.

5.10 Three-way stopcock - Ace No. 8143-05.

5.11 Vinyl tubing - Ace No. 12679-24.

5.12 Hot water bath/circulator - HAAKE No. F-4391.

5.13 Teflon® stir bars - Ace No. 13654-10.

5.14 Stirrer - Ace No. 13635.

5.15 Heat tape - Ace No. 12064-08.

5.16 Powerstat - Ace No. 12077.

5.17 Headspace vessel - Wheaton No. 991765.

5.18 Kovar to PX seal tubes - Ace No. Pt.976.

5.19 Stainless steel tubing - Supelco No. 2-0526.

5.20 Six-way Carle valve.

5.21 Stainless steel glass lined U-tube (1/8 in. ID).

5.22 Chromatography gravity flow column - Howe Scient. Inc., No. 3060-13 "purge tower".

5.23 Heat controller and thermocouple.

5.24 Glass wool "silanized".

5.25 HRGC column (30 m x 0.25 mm ID) Durabond DB-5, 0.25 µm film thickness (J&W Scientific, Rancho Cordova, CA) or equivalent.

5.26 Gas chromatograph - Finnigan 9610 or equivalent capable of maintaining 30°C isothermal and programmable to 200°C. The gas chromatograph must be equipped with a Grob split/splitless type injector.

5.27 Mass spectrometer - Finnigan 4000 quadrupole or equivalent, 70 eV electron impact ionization; capable of repetitive scan from 35-275 amu every 2-3 s, and produce a unit resolution (valleys between m/z 174-176 less than 10 percent of the height of the m/z 175 peak), background corrected mass spectrum from 50 ng 4-bromo-fluorobenzene (BFB) injected into the GC. The BFB spectrum must meet the mass intensity criteria in Table A-1. All portions of the HRGC column, transfer lines, and the HRGC column routed directly to the ion source shall remain at or above the column temperature during analysis to preclude condensation of less volatile compounds.

Table A-1. BFB Mass Intensity Specifications

Mass	Intensity required
50	15 to 40 percent of mass 95.
75	30 to 60 percent of mass 95.
95	base peak, 100 percent.
96	5 to 9 percent of mass 95.
173	< 2 percent of mass 174.
174	> 50 percent of mass 95.
176	95 to 100 percent of mass 174.
177	5 to 9 percent of mass 176.

5.28 Data system - Capable of collecting and recording MS data, storing mass intensity data in spectral libraries, processing HRGC/MS data and generating quantitation reports, and calculating and recording response factors.

5.28.1 Data acquisition - Mass spectra shall be collected continuously throughout the analysis and stored on a mass storage device.

5.28.2 Mass spectral libraries - User created libraries containing mass spectra obtained from analysis of authentic standards must be used to reverse search GC/MS runs for the compounds of interest.

5.28.3 Data processing - The data system shall be used to search, locate, identify, and quantitate the compounds of interest in each HRGC/MS analysis. Software routines shall be employed to compute retention times and extracted ion current plot (EICP) areas. Displays of spectra, mass chromatograms, and library comparisons are required to verify results.

5.28.4 Response factors and multi-point calibrations - The data system shall be used to record and maintain lists of response factors (response ratios for isotope dilution) and generate multi-point calibration curves. Computations of relative standard deviation (coefficient of variation) are useful for testing calibration linearity.

5.29 Balance - Analytical, capable of weighing 0.1 mg.

6.0 REAGENTS

6.1 Volatile organic-free water - prepare as described in Section 8.1.

6.2 Prepurified nitrogen.

6.3 Prepurified helium.

6.4 Tenax absorbent.

6.5 Internal standard compounds

6.5.1 Bromochloromethane, 1,4-dichlorobutane, and 1-chloro-2-bromopropane (a 20-mg/mL mixture, Supelco, Inc., No. 4-8823).

6.5.2 d_6-Benzene - Aldrich gold label (99.5% D) No. 15, 181-5.

6.5.3 d-Chloroform - Aldrich gold label (99.8% D) No. 15, 182-3.

6.5.4 d_2-1,1,2,2-Tetrachloroethane - M and D Isotopes No. MD-1416.

6.5.5 d_2-Methylene chloride - M and D Isotopes No. MD-53.

6.5.6 d_5-Chlorobenzene - KOR Isotopes (99% D_5) No. 521510.

6.5.7 1,4-d_4-Dichlorobenzene - KOR Isotopes (98% D_4) No. 521530.

6.5.8 d_{10}-Ethylbenzene - KOR Isotopes (98% D_{10}) No. 521443.

6.5.9 d_8-Toluene - KOR Isotopes (99.9% D_8) No. 510041.

6.5.10 d_{10}-p-Xylene - KOR Isotopes (98% D_{10}) No. 521133.

6.6 Target analytes

6.6.1 Bromoform - Aldrich gold label (99%/1% EtOH) (d 2.894 g/mL).

6.6.2 Dibromochloromethane - Columbia No. D1843 (d 2.45 g/mL).

6.6.3 Toluene - Burdick and Jackson H.P. No. A1-857 (d 0.867 g/mL).

6.6.4 1,1,2-Trichloroethane - Aldrich No. JB-070177 (95%) (d 1.435 g/mL).

6.6.5 Styrene - Eastman No. 1465 (d 1.34 g/mL).

6.6.6 Tetrachloroethene - Aldrich gold label No. 120457 (d 1.54 g/mL).

6.6.7 Bromodichloromethane - Aldrich No. 7628AH (98%) (d 1.49 g/mL).

6.6.8 Chlorobenzene - Aldrich No. 120277 (99%) (d 1.107 g/mL).

6.6.9 1,2-Dichlorobenzene - Aldrich No. D5-680-2 (98%) (d 1.306 g/mL).

6.6.10 Ethylbenzene - Aldrich No. E1-250-8 (99%) (d 0.867 g/mL).

6.6.11 1,1,2,2-Tetrachloroethane - Baker No. 017386 (d 1.586 g/mL).

6.6.12 1,1,1-Trichloroethane - Fisher No. 775974 (d 1.338 g/mL).

6.6.13 Chloroform - Burdick and Jackson H.P. No. AG594 (d 1.492 g/mL).

6.6.14 Benzene - MCB pest. grade No. U2738 (d 0.874 g/mL).

6.7 Methanol - Burdick and Jackson, high purity distilled in glass.

6.8 Tetraglyme - Aldrich 17-240-5.

6.9 Acetone - Burdick and Jackson, high purity distilled in glass.

6.10 Hexane - Burdick and Jackson, high purity distilled in glass.

7.0 HEADSPACE APPARATUS PREPARATION

7.1 Glassware preparation - All glassware is washed with a laboratory grade soap (i.e., Sparkleen or equivalent) and rinsed with deionized water, bulk grade acetone, B&J acetone, and finally B&J hexane. The glassware is air dried to remove traces of hexane and then dried in an oven at 200°C for 48 h before use.

7.2 Wheaton purge vessel - The Wheaton purge vessel thermometer and funnel arms were modified as follows. The threaded arms were cut near the vessel and replaced by 1/4-in. Kovar® to PX seal tubes (Ace Glass, Inc., No. PT.976). The Kovar® length was 1.0 in. The arms were made as short as possible to minimize dead volume. The vessel is integrated in the system as in Figure A-1.

7.3 Chromatographic gravity flow column (purge tower) - The column is connected to the system as displayed in Figure A-1. Two milliliters of volatile organic-free water is placed in the tower to trap excess water vapor.

7.4 Glass-lined U-tube sorbent trap - A 1.0-in. plug of Tenax is placed in the tube, and a plug of silanized glass wool placed at both ends. Do not overpack the Tenax. Pack only tight enough to avoid any dead volume in the Tenax. Overpacking will make it difficult to maintain a 40.0-mL/min helium flow under the 10.0 psi safety pressure.

Refer to Figure A-1 for a detailed orientation of all system components.

8.0 REAGENT PREPARATION

8.1 Volatile-free water - Volatile organic compounds are purged from water, taken from the Millipore system, by bubbling the prepurified nitrogen through the water for 24 h prior to use.

8.2 Internal standard preparation

8.2.1 Internal standard stock solution - The internal standard stock solution is prepared from compounds 6.5.2 through 6.5.10 by aliquotting each compound with a 100.0-µL syringe into a 10.0-mL volumetric containing 5.0 mL of methanol. The exact volume of each target analyte necessary to achieve a final concentration of 10 mg/mL for each compound can be determined from the density of the compound. After aliquotting all compounds, dilute to the mark with the methanol. Transfer the 10.0-mL solution to two 5.0-mL vials and seal tightly with the TFE-lined caps. Store in the freezer until needed.

8.2.2 Internal standard spiking solution - A 500-ng/µL internal standard spiking solution is prepared in tetraglyme by injecting 925.0 µL of tetraglyme into a 1.0-mL reaction vial with mininert cap. This is then spiked with 25.0-µL of the 3-component (20 mg/mL) Supelco standard and 50.0-µL of the 10.0-mg/mL internal standard stock of 8.2.1. Store in the freezer until needed.

8.3 Target analyte preparation

8.3.1 Target analyte stock solution - A 10.0-mg/mL each solution of the analytes from 6.6.1 through 6.6.14 is prepared as described for the internal standard stock solution in 8.2.1. Store in the freezer.

8.3.2 Target analyte spiking solution - A 100.0-ng/µL solution of each of the target analytes is prepared by injecting 990.0 µL of tetraglyme into a 1.0-mL reaction vial with mininert cap and spiking the tetraglyme with 10.0 µL of the stock solution of 8.3.1. Store in the refrigerator.

9.0 ANALYSIS ROUTINE

This routine must be followed after any system shutdown or at least once every 8 h prior to any sample analysis.

9.1 Perform an instrument mass calibration using bromofluorobenzene (BFB) to achieve the mass intensity specifications in Table A-1.

9.2 Conduct a purge tower instrument evaluation with the system set up as in Figure A-1.

9.2.1 Conduct a leak test by squirting VOA-free water around all connections, vessel cap, etc. Correct as needed. Check the bubble meter for the correct 40.0-mL/min flow. The Carle valve must be in the purge position.

9.2.2 Turn off the purge tower stopcock and immediately turn the helium supply off. Check the pressure gauge for a slow pressure falloff. If the gauge reading drops, check again for leaks.

9.2.3 Remove the purge tower cap.

9.2.4 Connect a 30-cm length of Teflon® tubing to the 10.0-mL syringe. Draw 3.0 mL of VOA-free water into the syringe. Remove the Teflon® tubing and draw 1.0 mL of air into the syringe. Using two separate 5.0-µL syringes, withdraw 2.0 µL of each working solution of 8.2.2 and 8.3.2. Spike the 10.0 mL syringe with each of the standard spiking

solutions. Be sure to inject directly into the water. Reseal the mininert valves and return the standards to a refrigerator. Replace the Teflon® tubing on the 10.0-mL syringe. Invert the syringe several times to ensure adequate mixing of the tetraglyme and water.

9.2.5 Inject the contents of the 10.0-mL syringe directly into the water at the bottom of the purge tower. The air in the syringe should push the water solution completely out, but should not be allowed to bubble out the end of the Teflon® tube. Immediately withdraw the Teflon® tube and recap the purge tower.

9.2.6 With the Carle valve in the purge mode, the Tenax trap at ambient temperature, and all heat tape lines at 150°C, turn on the helium supply valve and then the stopcock at the purge tower.

NOTE: If the stopcock on the purge tower is left closed, the helium gas may rupture the purge vessel.

Check the system for leaks. If a leak is detected, the system must be shut down and the purge tower cleaned as outlined below.

9.2.7 Purge the purge tower for 12 min at 40 mL/min.

9.2.8 After the purge is complete, turn the Carle valve to the desorb mode, heat the Tenax trap to approximately 250°C and initiate the HRGC/MS data acquisition. These three procedures are done as quickly as possible to maintain the absolute retention times between analysis. The gas chromatograph should be held isothermal at 30°C for 5 min then programmed to 125°C at 6°C/min. Hold at 125°C for 10 min and then program to 200°C before returning to 30°C.

9.2.9 During the HRGC/MS data acquisition, remove the purge tower cap and rinse the tower. Using the 10.0-mL syringe and Teflon® tube, alternately add and withdraw 10.0-mL portions of VOA-free water. Repeat this procedure a minimum of six times and discard each rinse. Reassemble the tower with 2.0 mL of VOA-free water.

9.2.10 After data acquisition is complete, check the HRGC/MS response to the internal standards. Note that often the initial analysis of the system following instrument shutdown will give variable responses. If this is observed and the responses are not equivalent to that previously regarded as optimum performance, the purge tower instrument evaluation must be repeated. Refer to Calculations (Section 11.0) for response factor calculations. Figure A-2 is an example of an HRGC/MS chromatogram obtained for an instrument performance check.

1. Benzene/d_6-benzene
2. Bromodichloromethane
3. Toluene/d_8-toluene
4. Bromochloropropane/ 1,1,2-trichloroethane
5. Dibromochloromethane
6. Tetrachloroethene
7. Chlorobenzene/ d_5-chlorobenzene
8. d_{10}-ethylbenzene
9. Ethylbenzene
10. d_{10}-p-xylene
11. Bromoform
12. Styrene
13. Dichlorobutane
14. 1,1,2,2-tetrachloroethane
15. d_4-1,4-dichlorobenzene
16. 1,2-dichlorobenzene

Purge Tower Standard

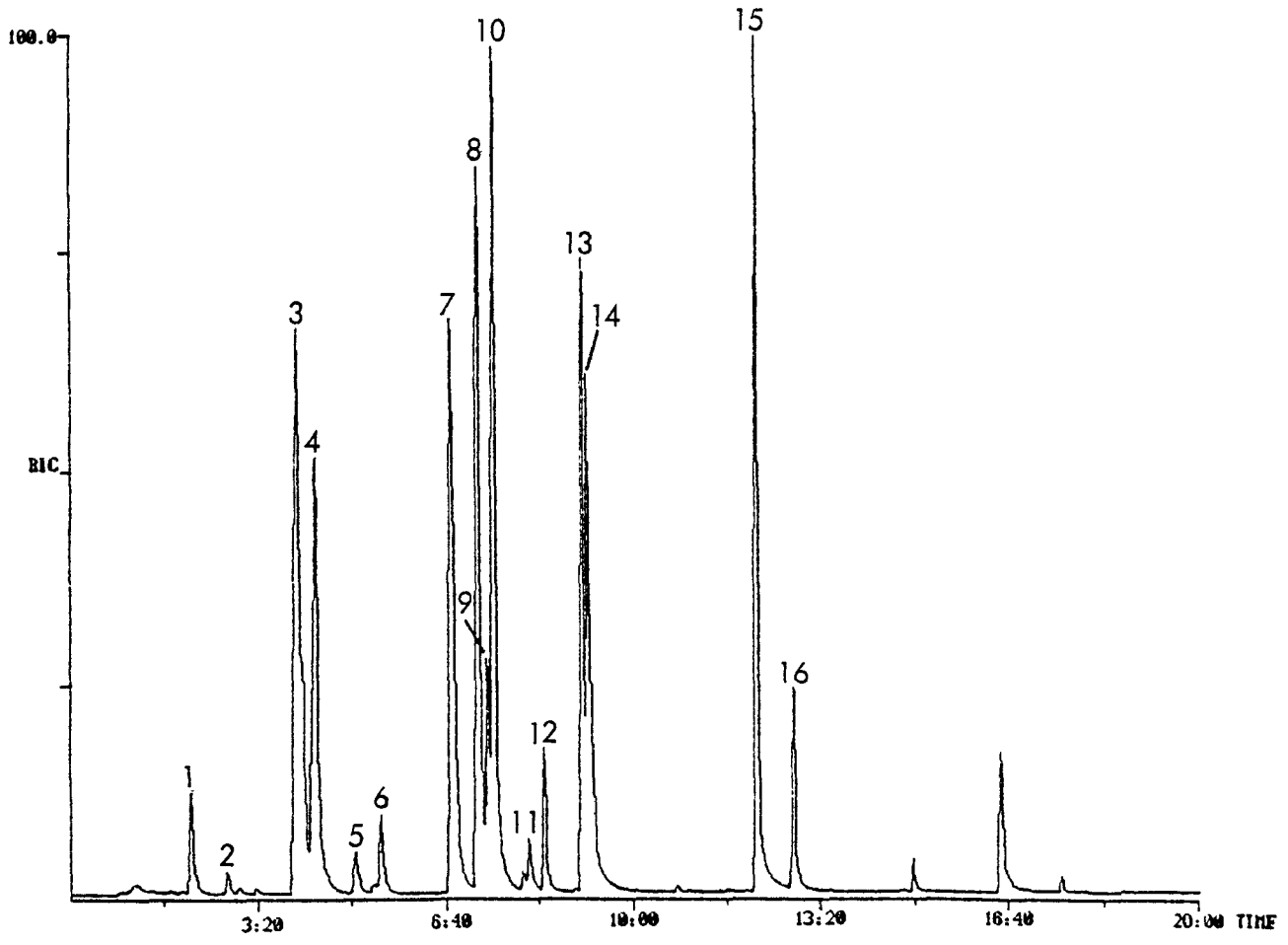

Figure A-2. HRGC/MS chromatogram of purge tower standard analyzed daily to document instrument performance.

9.3 External quality control check - External quality control checks (blind samples) should be conducted by the project Quality Control Coordinator (QCC) to demonstrate proper instrument calibration. These QC checks are performed periodically (typically on the first analysis day of each week).

9.3.1 Allow the Tenax trap to return to room temperature.

9.3.2 The QC check is conducted in the same manner as the purge tower instrument check, but the target analyte spiking solution is provided by the project Quality Control Coordinator (QCC).

9.3.3 The recoveries of the target analytes are calculated and provided to the QCC for evaluation. If the evaluation is adequate, the analyst proceeds with the system blank after completing the system rinse as in 9.2.9. If the QC check does not demonstrate acceptable performance, the analyst must recalibrate the system and repeat the QC check.

9.4 System blank

9.4.1 With the system set up as in Figure A-1, with the Carle valve in purge mode, add 80.0 mL of VOA-free water in the Wheaton vessel and check for leaks.

9.4.2 Turn the purge tower valve off and helium supply off.

9.4.3 Remove the Wheaton vessel cap and inject 2.0 µL of the internal standard solution. Follow 9.2.4, but substitute the vessel for the purge tower and omit the analyte solution.

9.4.4 Reseal the vessel, turn on the helium at the helium supply valve. When a pressure reading is observed in the system, open the stopcock at the purge tower; this will prevent water from seeping into the lines at the bottom of the purge tower. Check for leaks.

9.4.5 Turn on the stirrer and the valve at the three-way hot water junction, so that the heated (95°C) water will flow through the vessel jacket. Purge the system for 40.0 min.

9.4.6 After the 40.0-min purge, desorb as in 9.2.8.

9.4.7 Remove the modified Wheaton vessel and replace with a clean headspace apparatus containing 80.0 mL VOA-free water and clean stirring bar.

9.4.8 Determine the level of contaminants and record. If excessive background is observed, clean the purge tower, the transfer lines and repeat the system blank using a clean headspace apparatus.

9.5 Tissue standard - A tissue sample (20 g) spiked with known levels of the series of target analytes and internal standards should be analyzed daily to document relative response factors from the tissue matrix. Prior to initiating actual sample analysis, the analyst should analyze a series of adipose tissue samples spiked with 0.20 to 1.4 µg of each of the target analytes and 1.0 µg of each internal standard. The analyst should require a relative response factor consistency of ± 40% variability for the calibration curve and for day to day verification of the calibration. If the measured response factors are determined to vary by more than 40% of the average, the calibration curve must be re-established. The analyst must be aware that the background contribution of the tissue selected for spiked samples will effect the measured response factors. If the background contribution is significant, the analyst must analyze an unspiked sample to determine the level of background. Figure A-3 is an example of a spiked tissue standard.

9.5.1 With the system as in Figure A-1, turn off the purge tower stopcock and helium supply valve. Remove the Wheaton vessel cap and place 20.0 g of frozen adipose tissue in the 80.0 mL of water. Use the Fisher spatula to manipulate the frozen tissue. The adipose tissue used for the tissue standard analysis should be from a bulk supply so that each tissue standard will be subjected to the same matrix effects. Recap the vessel.

9.5.2 Spike this solution with 2.0 µL of each spike solution as in 9.2.4. Quickly recap the vessel.

9.5.3 Turn on the helium supply valve and open the purge tower stopcock. Be sure the Carle valve is in the purge position and the Tenax trap is at ambient temperature. Check for leaks.

9.5.4 Purge the vessel for 40 min. After the 40 min, desorb as in 9.2.8.

9.5.5 During data acquisition, clean and replace the Wheaton vessel.

9.5.6 Check the instrument response to the internal standard compounds. Calculate the response factor for each target analyte versus the respective internal standard and record.

1. Chloroform/d-chloroform
2. Bromochloromethane
3. 1,1,1-trichloroethane
4. Benzene/d_6-benzene
5. Bromodichloromethane
6. Toluene/d_8-toluene
7. 1,1,2-trichloroethane
8. Dibromochloromethane
9. Tetrachloroethene
10. Chlorobenzene/ d_5-chlorobenzene
11. d_{10}-ethylbenzene
12. Ethylbenzene
13. d_{10}-p-xylene
14. Bromoform
15. Styrene
16. 1,1,2,2-tetrachloroethane/ d_2-1,1,2,2-tetrachloroethane
17. d_4-1,4-dichlorobenzene
18. 1,2-dichlorobenzene

Tissue Standard

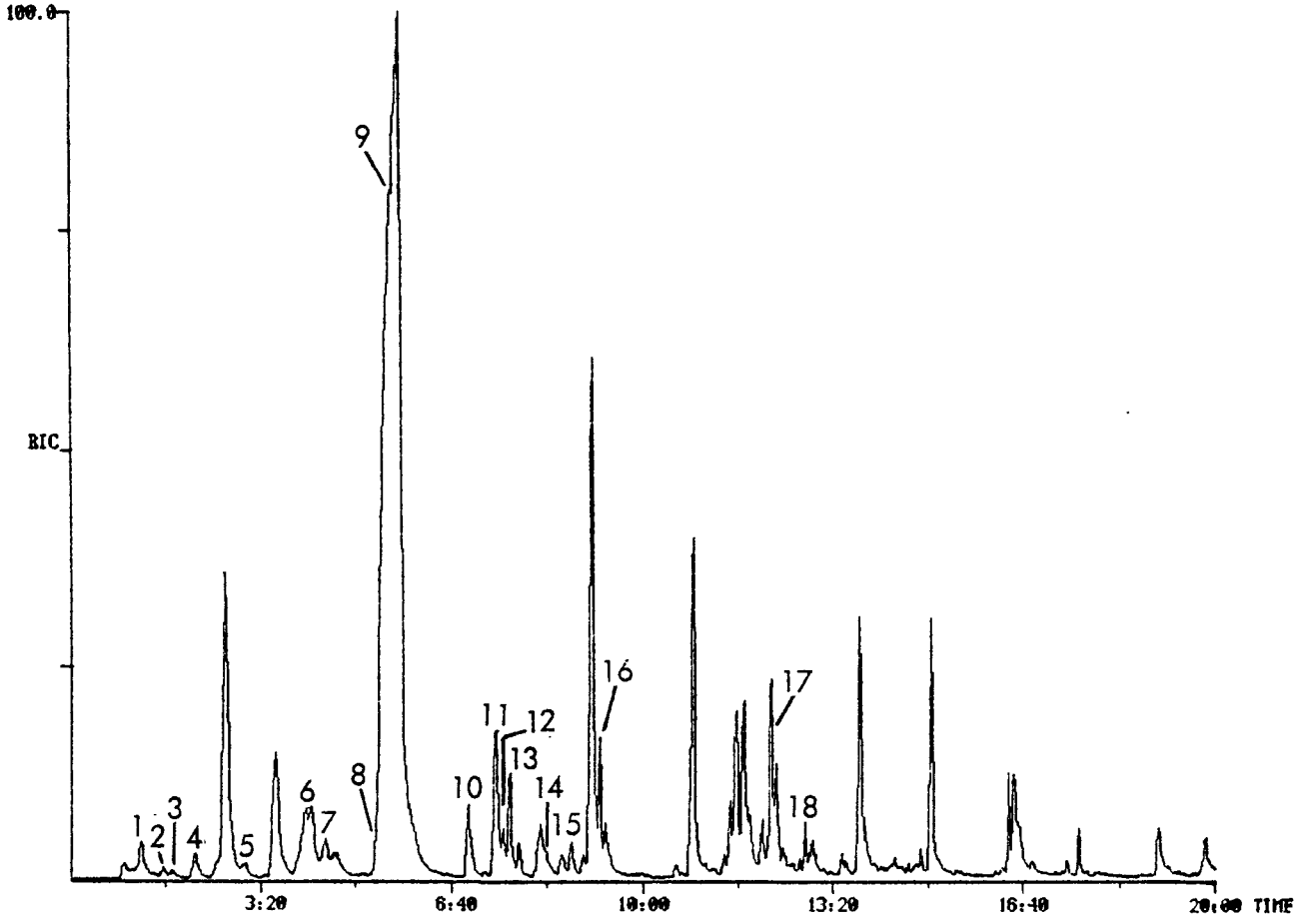

Figure A-3. HRGC/MS chromatogram for the volatile organic analysis of a bulk adipose tissue spiked with 1.0 μg of each internal standard and 0.20 μg of each target analyte.

9.6 Sample analysis

9.6.1 Sample analysis is achieved exactly the same manner as the tissue standard with the exception that the target analyte spiking solution is omitted. Figure A-4 is an example of the volatile organic analysis of a composite adipose tissue sample analyzed with the National Human Adipose Tissue Survey Fiscal Year 1982 samples.

9.6.2 Checking the instrument response after each acquisition and before proceeding to the next analysis will help prevent the loss of valuable samples.

10.0 QUALITATIVE IDENTIFICATION

Obtain EICPs for the primary quantitation ion and at least one secondary masses for each parameter of interest. The following criteria must be met to make a qualitative identification. Table A-2 provides a summary of the primary quantitation ions and the HRGC characteristics for each of the target analytes and internal standards.

10.1 The characteristic masses of each parameter of interest must maximize in the same or within one scan of each other.

10.2 The retention time must fall within ± 30 s of the retention time of the authentic compound.

10.3 The relative peak heights of the characteristic masses in the EICPs must fall within ± 20% of the relative intensities of these masses in a reference mass spectrum. The reference mass spectrum can be obtained from a standard analyzed in the HRGC/MS system or from a reference library.

11.0 CALCULATION

11.1 Relative response factors - Analyze each instrument performance check standard and spiked adipose tissue sample. Tabulate the area response of the characteristic quantitation ion against the concentration for each target analyte and its corresponding internal standard (Table A-2) and calculate relative response factors (RRF) using Equation 1:

Tentative Identification
of Major Peaks

1. Acetic acid ethyl ester/
   Propanoic acid propyl ester
2. Heptanal
3. Decane
4. Dimethyloctane
5. Trimethylcyclohexane
6. Nonanal
7. Undecene
8. Ethyl ester, carboxylic acid
9. Nonadienal

Middle Atlantic, 0-14 years

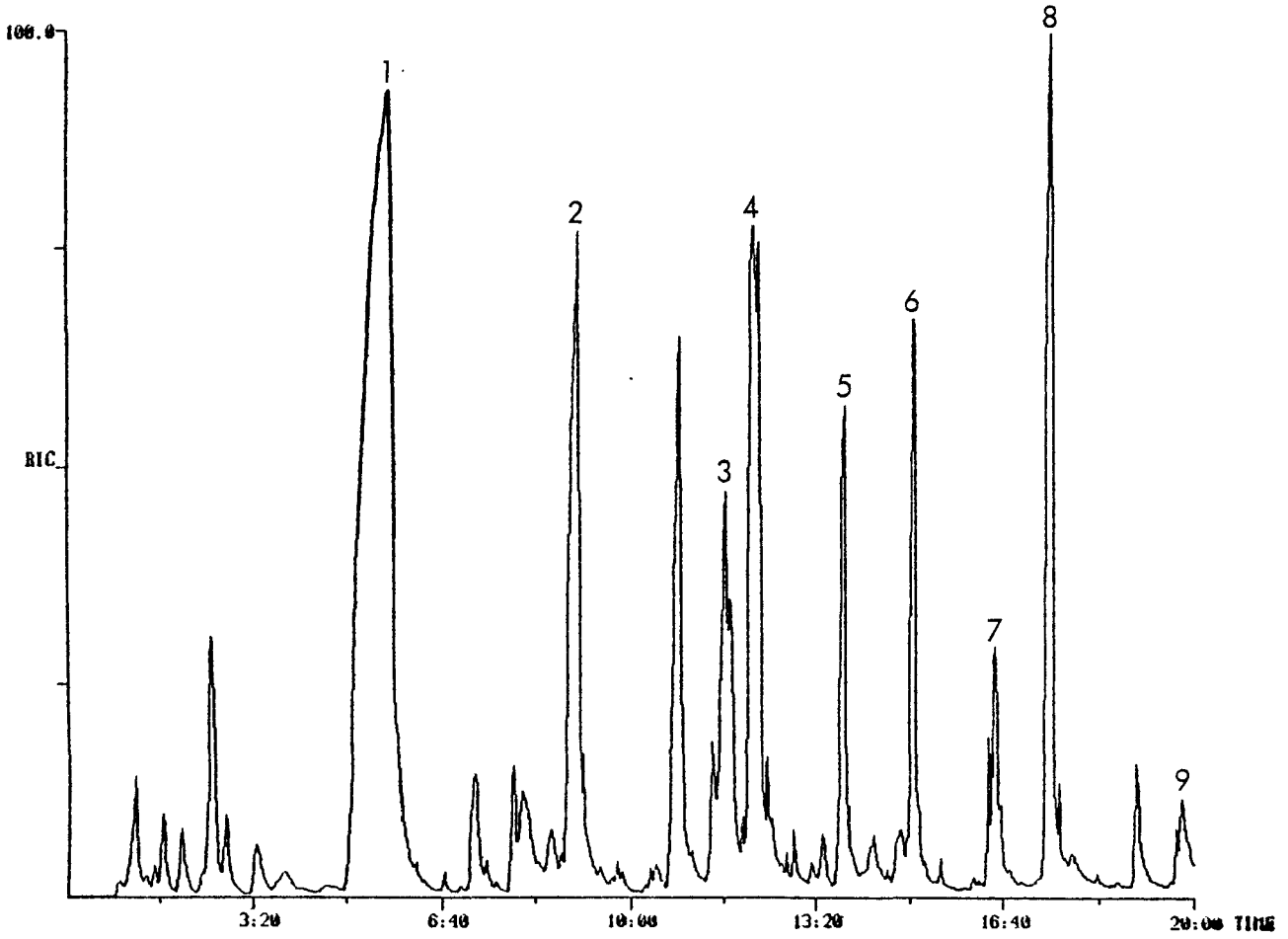

Figure A-4. HRGC/MS chromatogram of volatile compounds from the NHATS FY82 composite of the 0-14 yr age group from the Middle Atlantic Census Division.

Table A-2. Characteristic Ions, Relative Retention Times (RRT), and Internal Standards Used to Quantitate Target Volatile Organic Analytes

Compound	Characteristic quantitation ion (m/z)	RRT[a]	Internal standard
Bromochloropropane	77	1.00	Bromochloropropane
Chloroform	79	0.20-0.43	d-Chloroform
d-Chloroform	82	0.20-0.43	-
1,1,1-Trichloroehtane	97	0.35-0.58	Bromochlororopane
Bromodichloromethane	129	0.53-0.76	Bromochloropropane
Benzene	78	0.39-0.62	d_6-Benzene
d_6-Benzene	84	0.39-0.62	-
Tetrachloroethene	166	1.16-1.39	Bromochloropropane
Dibromochloromethane	129	1.05-1.28	Bromochloropropane
1,1,2-Trichloroethane	97	0.88-1.11	Bromochloropropane
Toluene	91	0.83-1.07	d_8-Toluene
d_8-Toluene	100	0.83-1.07	-
Chlorobenzene	112	1.48-1.72	d_5-Chlorobenzene
d_5-Chlorobenzene	117	1.48-1.72	-
Ethylbenzene	106	1.62-1.85	d_{10}-Ethylbenzene
d_{10}-Ethylbenzene	116	1.62-1.85	-
Bromoform	173	1.79-1.96	Bromochloropropane
Styrene	104	1.85-2.08	Bromochloropropane
1,1,2,2-Tetrachloroethane	83	2.05-2.28	d_2-1,1,2,2-Tetrachloroethane
d_2-1,1,2,2-Tetrachloro-ethane	84	2.05-2.28	-
1,2-Dichlorobenzene	146	2.88-3.11	d_4-1,4-Dichlorobenzene
d_4-1,4-Dichlorobenzene	150	2.73-2.96	-
1,4-Dichlorobenzene	146	2.73-2.96	d_4-1,4-Dichlorobenzene
Xylene	106	1.65-1.88	d_{10}-p-Xylene
d_{10}-p-Xylene	116	1.65-1.88	d_{10}-p-Xylene
Ethylphenol	122	2.19-2.43	d_{10}-Ethylbenzene

[a]Relative retention times calculated versus the internal standard, bromochloropropane.

Equation 1.

$$RRF = \frac{(A_s)(C_{is})}{(A_{is})(C_s)}$$

where: As = area of the characteristic quantitation ion for the target analyte.

A_{is} = area of the characteristic quantitation ion for the internal standard.

C_{is} = Concentration of the internal standard (µg).

C_s = Concentration of the compound to be measured.

If the RRF value over the working range is a constant (< 40% RSD), the RRF can be assumed to be invariant and the average RRF can be used for calculations. Alternatively, the results can be used to plot a calibration curve of response ratios, A_s/A_{is} vs. RRF.

11.2 When a target analyte has been identified, the quantitation of that compound should be based on the integrated abundance from the EICP of the primary quantitation ion given in Table A-2.

Calculate the concentration in the sample using the relative response factor (RRF) determined in Section 11.1 and Equation 2.

Equation 2.

$$\text{Concentration } (\mu g/g) = \frac{(A_s)(C_{is})}{(A_{is})(RRF)(Wt)}$$

where: A_s = area of the characteristic quantitation ion for the target analyte.

A_{is} = area of the characteristic quantitation ion for the internal standard.

C_{is} = concentration of the corresponding internal standard (µg).

Wt = wet tissue weight (g).

12.0 REPORTING

12.1 Report target analyte results are demonstrated in Figures A-5 and A-6.

12.2 Quantitative data must be qualified to provide an indication of the intensity of response. Quantitative data for target analytes

Report Date: _____

Prepared By: _____

Reviewed By: _____

HUMAN ADIPOSE TISSUE VOLATILE ORGANICS DATA REPORTING FORM

Compound: _____

Sample Composite No.	Laboratory No.	Wet Tissue Weight (g)	Total Mass Detected (μg)	Concentration Wet Tissue Weight (μg/g)	Analysis Date

Figure A-5. Example data report for volatile analytes detected in human adipose tissue.

Report Date: _____

Prepared By: _____

Reviewed By: _____

HUMAN ADIPOSE TISSUE DATA REPORTING FORM - VOLATILE ORGANICS

	Total µg/Composite Specimen				
Census Division	ES - East South Central				
Composite No.	(1)	(1)	(2)	(1)	(2)
Age Group	0-14	15-44	15-44	45+	45+
Sample Weight	25.6 g	19.0 g	24.3 g	20.6 g	19.3 g
Compound					
Chloroform					
1,1,1-Trichloroethane					
Bromodichloromethane					
Benzene					
Tetrachloroethene					
Dibromochloromethane					
1,1,2-Trichloroethane					
Toluene					
Chlorobenzene					
Ethylbenzene					
Bromoform					
Styrene					
1,1,2,2-Tetrachloroethane					
1,2-Dichlorobenzene					
1,4-Dichlorobenzene					
Xylene					
Ethylphenol					

Figure A-6. Example data report format for volatile organic analytes detected in composite samples from a specific census division.

responses of less than 2.5 times background signal-to-noise (limit of detection, LOD) are labeled as not detected (ND). Target analyte responses ranging from 2.5 to 10 times the background signal-to-noise are reported as trace (tr) values. Target analytes with response greater than 10 times the background signal-to-noise (limit of quantitation, LOQ) are considered positive quantifiable (PO) values.

13.0 METHOD PERFORMANCE

The method performance as determined by a single laboratory for instrument performance checks and spiked adipose tissue specimens are presented in Tables A-3 and A-4. These data were generated using a Finnigan 4000 quadrupole mass spectrometer for the analysis of 46 composite specimens from the National Human Adipose Tissue Survey (NHATS) Fiscal Year 1982 collection. The method detection limits are estimated to range from 0.001 to 0.10 μg/g from 20-g tissue samples depending on the specific analyte and the observed interferences.

Table A-3. Summary of the Internal QC Instrument Performance Checks for Selected Volatile Organic Analytes[a]

Date of analysis	6/20/84		6/21/84		6/26/84		7/2/84		7/9/84	
	Total µg	% Recovery	Total µg	% Recovery	Total µg	% Recovery	Total µg	% Recovery	Total µg	% Recovery
Compound										
1,1,1-Trichloroethane	0.44	110	ND	-	0.18	90	0.22	110	0.25	125
Bromodichloroethane	0.37	93	0.27	135	0.1	50	0.56	280	0.39	195
Benzene	0.42 (0.37)	110 (93)	0.27 (0.20)	140 (100)	0.09 (0.20)	45 (100)	0.6 (0.19)	300 (95)	0.42 (0.20)	210 (100)
Tetrachloroethene	0.35	88	0.18	90	0.19	95	0.19	95	0.23	115
Dibromochloroethane	0.39	98	0.19	95	0.19	95	0.19	95	0.18	90
1,1,2-Trichloroethane	0.40	100	0.18	90	0.21	105	0.29	100	0.19	95
Toluene	0.40 (0.43)	100 (110)	0.19 (0.17)	95 (88)	0.19 (0.20)	95 (100)	0.19 (0.19)	95 (95)	0.21 (0.19)	105 (95)
Chlorobenzene	0.43 (0.46)	110 (120)	0.18 (0.21)	90 (105)	0.29 (0.20)	100 (100)	0.18 (0.21)	90 (105)	0.19 (0.20)	95 (100)
Ethyl benzene	0.38 (0.41)	95 (100)	0.19 (0.20)	95 (100)	0.21 (0.20)	105 (100)	0.18 (0.19)	90 (95)	0.29 (0.20)	100 (100)
Bromoform	0.41	100	0.17	85	0.20	100	0.17	85	0.16	80
Styrene	0.38	95	0.19	95	0.20	100	0.18	90	0.18	90
1,1,2,2-Tetrachloroethane	0.39 (0.38)	98 (95)	0.17 (0.20)	85 (100)	0.21 (0.19)	105 (95)	0.18 (22)	90 (110)	0.16	80
1,2-Dichlorobenzene	0.38 (0.38)	95 (95)	0.18 (0.19)	90 (95)	0.21 (0.21)	105 (105)	0.18	90	ND	-

Date of analysis	7/10/84		7/11/84		7/13/84		7/17/84		7/18/84	
	Total µg	% Recovery	Total µg	% Recovery	Total µg	% Recovery	Total µg	% Recovery	Total µg	% Recovery
Compound										
1,1,1-Trichloroethane	0.21	105	0.19	95	0.20	100	0.24	120	0.19	95
Bromochloromethane	0.18	90	0.14	70	0.29	150	0.15	75	0.14	70
Benzene	0.19 (0.21)	95 (105)	0.15 (0.21)	75 (105)	0.36 (0.18)	180 (90)	0.13 (0.19)	65 (95)	0.13 (0.20)	65 (100)
Tetrachloroethene	0.21	105	0.19	95	0.19	95	0.21	105	0.22	110
Dibromochloromethane	0.20	100	0.21	105	0.18	90	0.22	110	0.21	105
1,1,2-Trichloroethane	0.20	100	0.21	105	0.20	100	0.21	105	0.22	110
Toluene	0.22 (0.23)	110 (115)	0.20 (0.20)	100 (100)	0.20 (0.18)	100 (90)	0.22 (0.23)	110 (120)	0.22 (0.24)	110 (120)
Chlorobenzene	0.20 (0.20)	100 (100)	0.20 (0.20)	100 (100)	0.19 (0.19)	95 (95)	0.22 (0.21)	110 (105)	0.22 (0.20)	110 (100)
Ethyl benzene	0.22 (0.22)	110 (110)	0.21 (0.20)	105 (100)	0.20 (0.18)	100 (90)	0.22 (0.20)	110 (100)	0.22 (0.21)	110 (105)
Bromoform	0.20	100	0.22	110	0.23	115	0.22	110	0.22	110
Styrene	0.20	100	0.21	105	0.28	140	0.22	110	0.21	105
1,1,2,2-Tetrachloroethane	0.22 (0.21)	110 (105)	0.22 (0.21)	115 (105)	0.26 (0.22)	130 (110)	0.23 (0.22)	115 (110)	0.23 (0.20)	115 (100)
1,2-Dichlorobenzene	0.21	105	0.21	105	0.30 (0.22)	150 (110)	0.23	115	0.22 (0.20)	110 (100)

[a]These QC samples were analyzed along with the actual composited FY82 specimens. The spiked samples were prepared by the MS analyst.
[b]Values in parentheses reflect the concentration or recovery based on the isotope dilution principle using the deuterated analog of the specific compound. All other calculations are versus the internal standard bromochloropropane.

Table A-4. Summary of Method Recovery (%) of Selected Volatile Organic Analytes Spiked into 20-g Aliquots of Human Adipose Tissue - Internal QA[a]

Date of analysis	6/21/84		6/26/84		6/27/84		6/28/84		6/29/84	
	Total µg	% Recovery	Total µg	% Recovery	Total µg	% Recovery	Total µg	% Recovery	Total µg	% Recovery
Compound										
Chloroform	ND	0	0.22	110	0.44 (0.15)[b]	220 (75)	0.27 (0.19)	135 (95)	ND	-
1,1,1-Trichloroethane	0.15	75	0.16	80	0.44	220	0.30	150	0.26	130
Bromodichloromethane	0.22	110	0.40	200	0.21	105	0.06	30	0.21	110
Benzene	0.23 (0.21)	115 (105)	0.22 (0.20)	110 (100)	0.27 (0.20)	135 (100)	0.26	130	0.15 (0.19)	90 (95)
Tetrachloroethene	0.41	205	0.17	85	0.14	70	0.20	100	0.30	150
Dibromochloromethane	0.19	95	0.20	100	0.29	145	0.21	105	0.22	110
1,1,2-Trichloroethane	0.16	80	0.20	100	0.20	100	0.18	90	0.20	100
Toluene	0.20 (0.20)	100 (100)	0.22 (0.19)	110 (95)	0.19 (0.15)	95 (75)	0.25 (0.27)	130 (140)	0.15 (0.15)	75 (75)
Chlorobenzene	0.19 (0.28)	95 (140)	0.20 (0.17)	100 (85)	0.32 (0.19)	160 (95)	0.36 (0.21)	180 (105)	0.17 (0.19)	85 (95)
Ethyl benzene	0.17 (0.20)	85 (100)	0.19 (0.24)	95 (120)	0.40 (0.20)	200 (100)	0.43 (0.22)	220 (110)	0.17 (0.19)	85 (95)
Bromoform	0.16	80	0.18	90	0.24	120	0.26	130	0.15	75
Styrene	0.17	85	0.21	105	0.41	205	0.46	230	0.16	80
1,1,2,2-Tetrachloroethane	0.17 (0.20)	85 (100)	0.20 (0.21)	100 (105)	0.36 (0.22)	180 (110)	0.41 (0.22)	205 (110)	0.16 (0.18)	80 (90)
1,2-Dichlorobenzene	0.18 (0.21)	90 (105)	0.21 (0.22)	105 (110)	0.47	235	0.42 (0.19)	210 (95)	ND	-

[a]These QC samples were analyzed along with the actual composited FY82 specimens. The spiked samples were prepared by the MS analyst.
[b]Values in parentheses reflect the concentration or recovery based on the isotope dilution principle using the deuterated analog of the specific compound. All other calculations are versus the internal standard bromochloropropane.

APPENDIX B

VOLATILE ORGANIC COMPOUND DATA FROM THE NHATS FY82 COMPOSITE HUMAN ADIPOSE TISSUE SAMPLES

Table B-1. Summary of the Total Mass of Selected Volatile Organic Compounds Determined in the Composited Human Adipose Tissues Representing the East South Central (ES) Census Division

Census division	Total µg/composite specimen[a]				
	ES - East South Central				
Composite no.	(1)	(1)	(2)	(1)	(2)
Age group	0-14	15-44	15-44	45+	45+
Sample weight	25.6 g	19.0 g	24.3 g	20.6 g	19.3 g
Compound					
Chloroform	ND (0.20)[b]	ND (0.21)	Tr, 0.088	ND (0.20)	ND (0.20)
1,1,1-Trichloroethane	0.46	ND (0.53)	1.6	ND (0.53)	2.0
Bromodichloromethane	ND (0.53)	ND (0.53)	ND (1.8)	ND (0.53)	ND (1.4)
Benzene	0.28	0.15	0.098	0.17	0.05
Tetrachloroethene	ND (0.05)	0.54	Tr, 0.11	ND (0.05)	0.24
Dibromochloromethane	ND (0.06)	ND (0.06)	ND (0.08)	ND (0.06)	ND (0.11)
1,1,2-Trichloroethane	ND (0.11)	ND (0.11)	ND (0.06)	ND (0.11)	ND (0.08)
Toluene	0.34	0.34	0.19	0.33	0.050
Chlorobenzene	0.096	0.34	0.094	0.053	0.030
Ethylbenzene	ND (0.05)	0.17	0.30	0.26	0.30
Bromoform	ND (0.16)	ND (0.16)	ND (0.08)	ND (0.16)	ND (0.11)
Styrene	0.96	1.5	0.69	0.95	0.89
1,1,2,2-Tetrachloroethane	ND (0.004)	ND (0.004)	0.052	ND (0.006)	0.15
1,2-Dichlorobenzene	0.045	ND (0.001)	Tr, 0.016	Tr, 0.005	Tr, 0.005
1,4-Dichlorobenzene	4.6	0.76	1.2	6.2	6.2
Xylene[c]	1.3	1.1	1.3	1.2	1.2
Ethylphenol	1.3	0.32	0.19	0.82	0.56

[a]Data for chloroform, benzene, toluene, chlorobenzene, ethylbenzene, xylene, ethylphenol, 1,1,2,2-tetrachloroethane and dichlorobenzene calculated by isotope dilution. Deuterated analogs of all compounds, with the exception of ethylphenol where deuterated ethylbenzene was used, were available as internal standards. All other compounds were quantitated versus the internal standard bromochloropropane (BCP).

[b]ND = Not determined. Value in parenthesis represents the estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).

[c]Two responses were quantitated, however, the specific isomers were not determined.

Table B-2. Summary of the Total Mass (μg) of Selected Volatile Organic Compounds Determined in the Composited Human Adipose Tissues Representing the Mountain (MO) Census Division

	Total μg/composite specimen[a]		
Census division	MO - Mountain		
Composite no.	(1)	(1)	(1)
Age group	0-14	15-44	45+
Sample weight	5.1 g	18.8 g	22.4 g
Compound			
Chloroform	0.21	1.54	2.78
1,1,1-Trichloroethane	ND (1.2)[b]	0.33	1.1
Bromodichloromethane	ND (2.3)	ND (1.0)	ND (1.2)
Benzene	0.49	0.38	0.26
Tetrachloroethene	ND (0.12)	ND (0.07)	Tr, 0.10
Dibromochloromethane	ND (0.12)	ND (0.1)	ND (0.12)
1,1,2-Trichloroethane	ND (0.23)	ND (0.07)	ND (0.08)
Toluene	0.18	0.28	0.55
Chlorobenzene	Tr, 0.011	0.12	0.090
Ethylbenzene	0.12	0.40	0.66
Bromoform	ND (0.23)	ND (0.10)	ND (0.12)
Styrene	1.8	1.8	1.7
1,1,2,2-Tetrachloroethane	ND (0.007)	ND (0.005)	ND (0.009)
1,2-Dichlorobenzene	ND (0.001)	Tr, 0.015	Tr, 0.016
1,4-Dichlorobenzene	0.091	1.1	0.80
Xylene[c]	0.62	2.0	3.4
Ethylphenol	1.4	1.2	2.3

[a]Data for chloroform, benzene, toluene, chlorobenzene, ethylbenzene, xylene, ethylphenol, 1,1,2,2-tetrachloroethane and dichlorobenzene calculated by isotope dilution. Deuterated analogs of all compounds, with the exception of ethylphenol where deuterated ethylbenzene was used, were available as internal standards. All other compounds were quantitated versus the internal standard bromochloropropane (BCP).

[b]ND = Not determined. Value in parenthesis represents the estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).

[c]Two responses were quantitated, howver, the specific isomers were not determined.

Table B-3. Summary of the Total Mass of Selected Volatile Organic Compounds Determined in the Composited Human Adipose Tissues Representing the West South Central (WS) Census Division

Census division	Total µg/composite specimen[a]			
	WS - West South Central			
Composite no.	(1)	(1)	(2)	(1)
Age group	0-14	15-44	15-44	45+
Sample weight	6.0 g	22.4 g	21.9 g	22.0 g
Compound				
Chloroform	ND (0.60)[b]	0.29	0.12	ND (0.74)
1,1,1-Trichloroethane	5.0	ND (1.6)	1.6	ND (1.9)
Bromodichloromethane	ND (3.0)	ND (3.2)	ND (1.8)	ND (3.7)
Benzene	ND (0.08)	0.31	0.067	0.51
Tetrachloroethene	ND (0.20)	ND (0.16)	0.35	ND (0.19)
Dibromochloromethane	ND (0.20)	ND (0.16)	ND (0.08)	ND (0.19)
1,1,2-Trichloroethane	ND (0.30)	ND (0.32)	ND (0.06)	ND (0.37)
Toluene	0.22	ND (0.004)	0.18	0.76
Chlorobenzene	0.015	0.063	0.031	0.19
Ethylbenzene	1.7	5.6	1.4	3.7
Bromoform	ND (0.30)	ND (0.32)	ND (0.08)	ND (0.37)
Styrene	1.5	1.4	0.90	3.0
1,1,2,2-Tetrachloroethane	ND (0.01)	ND (0.03)	ND (0.008)	ND (0.03)
1,2-Dichlorobenzene	ND (0.004)	Tr, 0.037	ND (0.004)	Tr, 0.022
1,4-Dichlorobenzene	2.1	2.6	11	4.3
Xylene[c]	8.6	25	7.8	18
Ethylphenol	2.4	3.0	0.28	0.96

[a]Data for chloroform, benzene, toluene, chlorobenzene, ethylbenzene, xylene, ethylphenol, 1,1,2,2-tetrachloroethane and dichlorobenzene calculated by isotope dilution. Deuterated analogs of all compounds, with the exception of ethylphenol where deuterated ethylbenzene was used, were available as internal standards. All other compounds were quantitated versus the internal standard bromochloropropane (BCP).

[b]ND = Not determined. Value in parenthesis represents the estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).

[c]Two responses were quantitated, however, the specific isomers were not determined.

Table B-4. Summary of the Total Mass (μg) of Selected Volatile Organic Compounds Determined in the Composited Human Adipose Tissues Representing the East North Central (EN) Census Division

Census division	Total μg/composite specimen[a]							
	EN - East North Central							
Composite no.	(1)	(2)	(1)	(2)	(3)	(1)	(2)	(3)
Age group	0-14	0-14	15-44	15-44	15-44	45+	45+	45+
Sample weight	12.7 g	17.3 g	20.8 g	21.1 g	19.6 g	18.6 g	22.6 g	21.4 g
Compound								
Chloroform	0.56	0.32	12.0	1.7	0.16	0.18	0.17	Tr, 0.030
1,1,1-Trichloroethane	ND (0.53)[b]	ND (0.41)	ND (0.80)	2.1	ND (0.46)	ND (0.89)	ND (0.22)	1.3
Bromodichloromethane	ND (1.5)	ND (1.4)	ND (2.2)	ND (3.9)	ND (1.8)	ND (2.5)	ND (0.89)	ND (1.8)
Benzene	0.13	0.31	0.18	0.47	0.070	0.27	0.23	ND (0.095)
Tetrachloroethene	0.72	ND (0.05)	ND (0.33)	1.3	0.29	ND (0.38)	1.9	0.39
Dibromochloromethane	ND (0.15)	ND (0.14)	ND (0.22)	ND (0.39)	ND (0.080)	ND (0.25)	ND (0.09)	ND (0.08)
1,1,2-Trichloroethane	ND (0.11)	ND (0.07)	ND (0.17)	ND (0.19)	ND (0.060)	ND (0.19)	ND (0.04)	ND (0.06)
Toluene	0.36	0.33	0.72	0.54	0.17	0.96	5.6	0.32
Chlorobenzene	0.030	0.036	0.13	0.030	0.042	0.030	0.042	0.12
Ethylbenzene	1.7	1.0	2.0	0.64	0.42	0.91	0.94	0.72
Bromoform	ND (0.46)	ND (0.11)	ND (0.67)	ND (0.19)	ND (0.008)	ND (0.076)	ND (0.01)	ND (0.08)
Styrene	3.2	0.64	2.7	1.7	0.90	2.2	1.4	1.3
1,1,2,2-Tetrachloroethane	ND (0.001)	ND (0.090)	0.040	ND (0.010)	ND (0.006)	ND (0.006)	ND (0.007)	ND (0.007)
1,2-Dichlorobenzene	0.081	Tr, 0.011	Tr, 0.020	Tr, 0.020	ND (0.002)	Tr, 0.017	ND (0.010)	Tr, 0.018
1,4-Dichlorobenzene	0.51	1.5	4.9	2.2	2.0	2.1	5.1	2.3
Xylene[c]	7.8	4.7	11	3.5	2.7	4.5	5.7	4.8
Ethylphenol	1.2	0.95	0.81	1.9	0.20	0.61	0.18	0.57

[a]Data for chloroform, benzene, toluene, chlorobenzene, ethylbenzene, xylene, ethylphenol, 1,1,2,2-tetrachloroethane and dichlorobenzene calculated by isotope dilution. Deuterated analogs of all compounds, with the exception of ethylphenol where deuterated ethylbenzene was used, were available as internal standards. All other compounds were quantitated versus the internal standard bromochloropropane (BCP).

[b]ND = Not determined. Value in parenthesis represents the estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).

[c]Two responses were quantitated, however, the specific isomers were not determined.

Table B-5. Summary of the Total Mass (μg) of Selected Volatile Organic Compounds Determined in the Composited Human Adipose Tissues Representing the Middle Atlantic (MA) Census Division

	Total μg/composite specimen[a]					
Census division	MA - Middle Atlantic					
Composite no.	(1)	(2)	(1)	(2)	(1)	(2)
Age group	0-14	0-14	15-44	15-44	45+	45+
Sample weight	20.3 g	18.1 g	25.0 g	25.3 g	15.5 g	17.8 g
Compound						
Chloroform	0.13	ND (0.14)	0.16	2.0	0.21	Tr, 0.10
1,1,1-Trichloroethane	ND (0.34)	ND (0.35)	2.4	0.77	ND (0.43)	ND (0.53)
Bromodichloromethane	ND (0.76)	ND (0.70)	ND (0.90)	ND (2.3)	ND (0.95)	ND (1.8)
Benzene	0.13	0.19	0.20	0.64	0.20	0.26
Tetrachloroethene	0.99	0.29	1.9	0.76	1.5	0.81
Dibromochloromethane	ND (0.19)	ND (0.070)	ND (0.25)	ND (0.23)	ND (0.24)	ND (0.18)
1,1,2-Trichloroethane	ND (0.11)	ND (0.050)	ND (0.15)	ND (0.12)	ND (0.14)	ND (0.09)
Toluene	0.090	0.14	0.17	0.23	0.21	ND (0.004)
Chlorobenzene	0.040	Tr, 0.011	0.060	0.17	0.050	0.044
Ethylbenzene	0.17	0.12	0.35	0.31	0.21	0.001
Bromoform	ND (0.11)	ND (0.070)	ND (0.15)	ND (0.19)	ND (0.14)	ND (0.14)
Styrene	0.84	0.80	0.98	0.98	0.69	0.74
1,1,2,2-Tetrachloroethane	ND (0.006)	ND (0.008)	ND (0.010)	ND (0.010)	ND (0.012)	ND (0.01)
1,2-Dichlorobenzene	Tr, 0.028	Tr, 0.005	Tr, 0.027	Tr, 0.035	Tr, 0.022	Tr, 0.015
1,4-Dichlorobenzene	0.60	0.43	0.44	8.2	0.91	3.9
Xylene[c]	0.39	0.50	1.4	1.3	0.84	0.73
Ethylphenol	0.42	0.85	1.7	1.7	1.9	0.56

[a]Data for chloroform, benzene, toluene, chlorobenzene, ethylbenzene, xylene, ethylphenol, 1,1,2,2-tetrachloroethane and dichlorobenzene calculated by isotope dilution. Deuterated analogs of all compounds, with the exception of ethylphenol where deuterated ethylbenzene was used, were available as internal standards. All other compounds were quantitated versus the internal standard bromochloropropane (BCP).

[b]ND = Not determined. Value in parenthesis represents the estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).

[c]Two responses were quantitated, however, the specific isomers were not determined.

Table B-6. Summary of the Total Mass of Selected Volatile Organic Compounds Deterined in the Composited Human Adipose Tissues Representing the West North Central (WN) Census Division

	Total µg/composite specimen[a]			
Census division	WN - West North Central			
Composite no.	(1)	(1)	(1)	(2)
Age group	0-14	15-44	45+	45+
Sample weight	18.9 g	21.6 g	21.6 g	18.3 g
Compound				
Chloroform	ND (0.032)	0.31	0.15	0.23
1,1,1-Trichloroethane	ND (0.47)[b]	ND (0.47)	0.58	ND (0.40)
Bromodichloromethane	ND (0.94)	ND (0.94)	ND (1.0)	ND (1.6)
Benzene	0.090	0.34	0.10	0.12
Tetrachloroethene	0.51	0.39	0.79	0.58
Dibromochloromethane	ND (0.14)	ND (0.14)	ND (0.21)	ND (0.16)
1,1,2-Trichloroethane	ND (0.094)	ND (0.094)	ND (0.021)	ND (0.08)
Toluene	0.15	0.40	0.13	0.055
Chlorobenzene	0.020	0.020	0.020	0.032
Ethylbenzene	0.32	0.99	0.16	0.53
Bromoform	ND (0.094)	ND (0.094)	ND (0.052)	ND (0.080)
Styrene	0.30	0.61	0.18	0.55
1,1,2,2-Tetrachloroethane	ND (0.001)	ND (0.001)	ND (0.003)	ND (0.09)
1,2-Dichlorobenzene	Tr, 0.007	ND (0.010)	0.040	ND (0.017)
1,4-Dichlorobenzene	1.1	0.48	1.1	0.301
Xylene[c]	1.5	1.7	0.59	1.5
Ethylphenol	1.4	0.10	Tr, 0.01	0.12

[a]Data for chloroform, benzene, toluene, chlorobenzene, ethylbenzene, xylene, ethylphenol, 1,1,2,2-tetrachloroethane and dichlorobenzene calculated by isotope dilution. Deuterated analogs of all compounds, with the exception of ethylphenol where deuterated ethylbenzene was used, were available as internal standards. All other compounds were quantitated versus the internal standard bromochloropropane (BCP).

[b]ND = Not determined. Value in parenthesis represents the estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).

[c]Two responses were quantitated, however, the specific isomers were not determined.

Table B-7. Summary of the Total Mass of Selected Volatile Organic Compounds Determined in the Composited Human Adipose Tissues Representing the South Atlantic (SA) Census Division

Census division	Total µg/composite specimen[a]									
	SA - South Atlantic									
Composite no.	(1)	(2)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Age group	0-14	0-14	15-44	15-44	15-44	15-44	45+	45+	45+	45+
Sample weight	12.6 g	16.7 g	22.2 g	18.7 g	10.1 g	17.8 g	15.4 g	23.2 g	13.8 g	11.6 g
Compound										
Chloroform	1.8	1.8	1.3	0.15	3.0	ND (0.07)	0.64	0.83	0.80	ND (0.31)
1,1,1-Trichloroethane	ND (0.57)[b]	0.67	0.79	0.45	1.0	ND (0.94)	0.42	2.1	3.7	ND (0.60)
Bromodichloromethane	ND (1.9)	ND (3.4)	ND (1.0)	ND (2.3)	ND (1.4)	ND (2.3)	ND (1.6)	ND (1.1)	ND (1.5)	ND (1.5)
Benzene	0.19	0.10	0.30	0.12	0.10	0.14	0.34	0.077	0.10	0.043
Tetrachloroethene	ND (0.38)	ND (0.050)	1.6	Tr, 0.11	Tr, 0.031	0.60	ND (0.31)	Tr, 0.061	0.061	ND (0.080)
Dibromochloromethane	ND (0.050)	ND (0.17)	ND (0.030)	ND (0.12)	ND (0.11)	ND (0.19)	ND (0.040)	ND (0.060)	ND (0.12)	ND (0.12)
1,1,2-Trichloroethane	ND (0.050)	ND (0.14)	ND (0.030)	ND (0.090)	ND (0.083)	ND (0.140)	ND (0.040)	ND (0.050)	ND (0.090)	ND (0.090)
Toluene	0.36	ND (0.003)	0.84	0.023	0.41	0.61	0.45	0.28	0.45	ND (0.005)
Chlorobenzene	0.27	0.033	0.26	0.083	0.070	0.030	ND (0.040)	0.053	0.025	ND (0.015)
Ethylbenzene	0.85	3.5	2.0	1.5	1.8	1.2	1.3	1.7	1.6	Tr, 0.023
Bromoform	ND (0.10)	ND (0.17)	ND (0.050)	ND (0.12)	ND (0.11)	ND (0.19)	ND (0.050)	ND (0.060)	ND (0.12)	ND (0.12)
Styrene	1.3	3.0	1.6	1.3	3.3	1.3	1.2	1.5	1.6	0.11
1,1,2,2-Tetrachloroethane	ND (0.002)	ND (0.010)	ND (0.002)	ND (0.006)	ND (0.040)	ND (0.010)	ND (0.001)	ND (0.007)	ND (0.007)	Tr, 0.005
1,2-Dichlorobenzene	ND (0.010)	Tr, 0.017	ND (0.010)	Tr, 0.023	ND (0.007)	ND (0.015)	ND (0.010)	ND (0.010)	ND (0.001)	ND (0.007)
1,4-Dichlorobenzene	1.2	3.1	1.3	1.1	3.5	7.1	1.5	3.9	3.5	0.19
Xylene[c]	3.6	3.8	12	6.9	9.3	6.8	8.0	7.2	8.8	0.21
Ethylphenol	4.7	3.4	0.82	0.98	0.77	1.1	0.86	0.28	0.74	0.38

[a]Data for chloroform, benzene, toluene, chlorobenzene, ethylbenzene, xylene, ethylphenol, 1,1,2,2-tetrachloroethane and dichlorobenzene calculated by isotope dilution. Deuterated analogs of all compounds, with the exception of ethylphenol where deuterated ethylbenzene was used, were available as internal standards. All other compounds were quantitated versus the internal standard bromochloropropane (BCP).

[b]ND = Not determined. Value in parenthesis represents the estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).

[c]Two responses were quantitated, however, the specific isomers were not determined.

Table B-8. Summary of the Total Mass of Selected Volatile Organic Compounds Determined in the Composited Human Adipose Tissues Representing the New England (NE) Census Division

	Total µg/composite specimen[a]			
Census division	NE - New England			
Composite no.	(1)	(1)	(1) "repeat"	(1)
Age group	0-14	15-44	15-44	45+
Sample weight	20.0 g	23.6 g	23.6 g	25.5 g
Compound				
Chloroform	Tr, 0.070	Tr, 0.070	Tr, 0.060	0.16
1,1,1-Trichloroethane	ND (0.44)[b]	ND (0.44)	0.39	ND (2.7)
Bromodichloromethane	ND (2.2)	ND (2.2)	ND (4.2)	ND (5.4)
Benzene	0.69	0.58	0.63	0.50
Tetrachloroethene	ND (0.08)	ND (0.08)	ND (0.15)	ND (0.80)
Dibromochloromethane	ND (0.22)	ND (0.22)	ND (0.42)	ND (0.50)
1,1,2-Trichloroethane	ND (0.22)	ND (0.22)	ND (0.42)	ND (0.50)
Toluene	0.44	1.0	1.2	0.38
Chlorobenzene	0.040	0.10	0.10	0.060
Ethylbenzene	2.9	1.7	2.1	1.7
Bromoform	ND (0.22)	ND (0.22)	ND (0.42)	ND (0.30)
Styrene	2.2	4.1	3.7	3.2
1,1,2,2-Tetrachloroethane	ND (0.020)	c	ND (0.030)	ND (0.020)
1,2-Dichlorobenzene	Tr, 0.019	c	Tr, 0.020	ND (0.010)
1,4-Dichlorobenzene	0.45	c	2.6	0.30
Xylene[d]	3.8	8.2	11	9.7
Ethylphenol	2.3	0.91	4.2	3.9

[a]Data for chloroform, benzene, toluene, chlorobenzene, ethylbenzene, xylene, ethylphenol, 1,1,2,2-tetrachloroethane and dichlorobenzene calculated by isotope dilution. Deuterated analogs of all compounds, with the exception of ethylphenol where deuterated ethylbenzene was used, were available as internal standards. All other compounds were quantitated versus the internal standard bromochloropropane (BCP).

[b]ND = Not determined. Value in parenthesis represents the estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).

[c]The HRGC/MS program was interrupted before the analysis was completed.

[d]Two responses were quantitated, however, the specific isomers were not determined.

Table B-9. Summary of the Total Mass of Selected Volatile Organic Compounds Determined in the Composited Human Adipose Tissues Representing the Pacific (PA) Census Division

	Total µg/composite specimen[a]		
Census division		PA - Pacific	
Composite no.	(1)	(1)	(1)
Age group	0-14	15-44	45+
Sample weight	15.0 g	17.4 g	20.7 g
Compound			
Chloroform	1.1	Tr, 0.10	Tr, 0.050
1,1,1-Trichloroethane	4.2	1.8	ND (0.30)
Bromodichloromethane	ND (0.80)	ND (2.3)	ND (1.1)
Benzene	0.14	0.22	0.17
Tetrachloroethene	ND (0.060)	0.19	Tr, 0.11
Dibromochloromethane	ND (0.050)	ND (0.23)	ND (0.11)
1,1,2-Trichloroethane	ND (0.30)	ND (0.23)	ND (0.11)
Toluene	0.17	0.34	0.26
Chlorobenzene	0.030	0.040	0.020
Ethylbenzene	ND (0.040)	0.68	0.58
Bromoform	ND (0.30)	ND (0.23)	ND (0.11)
Styrene	0.75	2.5	1.0
1,1,2,2-Tetrachloroethane	ND (0.010)	ND (0.020)	ND (0.010)
1,2-Dichlorobenzene	Tr, 0.009	0.073	Tr, 0.011
1,4-Dichlorobenzene	1.7	0.29	0.30
Xylene[c]	0.35	0.81	0.62
Ethylphenol	0.72	0.55	0.35

[a]Data for chloroform, benzene, toluene, chlorobenzene, ethylbenzene, xylene, ethylphenol, 1,1,2,2-tetrachloroethane and dichlorobenzene calculated by isotope dilution. Deuterated analogs of all compounds, with the exception of ethylphenol where deuterated ethylbenzene was used, were available as internal standards. All other compounds were quantitated versus the internal standard bromochloropropane (BCP).

[b]ND = Not determined. Value in parenthesis represents the estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).

[c]Two responses were quantitated, however, the specific isomers were not determined.

Table B-10. Summary of the Concentration (ng/g) of Target Volatile Organic Compounds in Composite Human Adipose Tissue Specimens Representing the East South Central (ES) Census Division

Census division	ES - East South Central				
Composite no.	(1)	(1)	(2)	(1)	(2)
Age group	0-14	15-44	15-44	45+	45+
Compound[a]					
Chloroform	ND (8)[b]	ND (11)	Tr, 3.6	ND (10)	ND (10)
1,1,1-Trichloroethane	18	ND (28)	66	ND (21)	100
Bromodichloromethane	ND (21)	ND (28)	ND (74)	ND (21)	ND (73)
Benzene	11	7.9	4.0	8.3	2.6
Tetrachloroethene	ND (2)	29	Tr, 4.6	ND (3)	12
Dibromochloromethane	ND (2)	ND (3)	ND (3)	ND (2)	ND (6)
1,1,2-Trichloroethane	ND (4)	ND (6)	ND (2)	ND (5)	ND (4)
Toluene	13	18	7.6	16	2.5
Chlorobenzene	3.8	1.7	3.9	2.6	1.6
Ethylbenzene	ND (2)	9.0	12.1	13	16
Bromoform	ND (6)	ND (8)	ND (3)	ND (8)	ND (6)
Styrene	38	79	28.4	46	46
1,1,2,2-Tetrachloroethane	ND (0.2)	ND (0.2)	2.1	ND (0.3)	8.0
1,2-Dichlorobenzene	1.8	ND (0.1)	Tr, 0.7	Tr, 0.2	Tr, 0.3
1,4-Dichlorobenzene	180	40	49	300	320
Xylene[c]	49	56	55	57	60
Ethylphenol	50	17	8	40	29

[a]Data for chloroform, benzene, toluene, chlorobenzene, ethylbenzene, xylene, ethylphenol, 1,1,2,2-tetrachloroethane and dichlorobenzene calculated by isotope dilution. Deuterated analogs of all compounds, with the exception of ethylphenol where deuterated ethylbenzene was used, were available as internal standards. All other compounds were quantitated versus the internal standard bromochloropropane (BCP).

[b]ND = not detected. Value in parenthesis signifies an estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).

[c]Two responses were quantitated, however, the specific isomers were not determined.

Table B-11. Summary of the Concentration (ng/g) of Target Volatile Organic Compounds in Composite Human Adipose Tissue Specimens Representing the Mountain (MO) Census Division

Census division	MO - Mountain		
Composite no.	(1)	(1)	(1)
Age group	0-14	15-44	45+
Compound[a]			
Chloroform	41	82	120
1,1,1-Trichloroethane	ND (240)[b]	18	49
Bromodichloromethane	ND (450)	ND (53)	ND (50)
Benzene	97	20	12
Tetrachloroethene	ND (24)	ND (4)	Tr, 5
Dibromochloromethane	ND (24)	ND (5)	ND (4)
1,1,2-Trichloroethane	ND (45)	ND (4)	ND (4)
Toluene	35	15	25
Chlorobenzene	Tr, 2.2	6.4	4.0
Ethylbenzene	24	21	30
Bromoform	ND (45)	ND (5)	ND (5)
Styrene	353	96	76
1,1,2,2-Tetrachloroethane	ND (2)	ND (0.3)	ND (0.4)
1,2-Dichlorobenzene	ND (0.2)	Tr, 0.8	Tr, 0.7
1,4-Dichlorobenzene	18	59	36
Xylene[c]	120	110	150
Ethylphenol	270	64	100

[a]Data for chloroform, benzene, toluene, chlorobenzene, ethylbenzene, xylene, ethylphenol, 1,1,2,2-tetrachloroethane and dichlorobenzene calculated by isotope dilution. Deuterated analogs of all compounds, with the exception of ethylphenol where deuterated ethylbenzene was used, were available as internal standards. All other compounds were quantitated versus the internal standard bromochloropropane (BCP).

[b]ND = not detected. Value in parenthesis signifies an estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).

[c]Two responses were quantitated, however, the specific isomers were not determined.

Table B-12. Summary of the Concentration (ng/g) of Target Volatile Organic Compounds in Composite Human Adipose Tissue Specimens Representing the West South Center (WS) Census Division

Census division	WS - West South Central			
Composite no.	(1)	(1)	(2)	(1)
Age group	0-14	15-44	15-44	45+
Compound[a]				
Chloroform	ND (100)[b]	13	5.3	ND (34)
1,1,1-Trichloroethane	830	ND (71)	75	ND (84)
Bromodichloromethane	ND (500)	ND (140)	ND (82)	ND (170)
Benzene	ND (13)	14	3.1	23
Dibromochloromethane	ND (33)	ND (7)	ND (4)	ND (9)
1,1,2-Trichloroethane	ND (50)	ND (14)	ND (3)	ND (17)
Toluene	37	ND (0.2)	8.4	35
Chlorobenzene	2.5	3.0	1.4	8.6
Ethylbenzene	280	250	64	168
Bromoform	ND (50)	ND (14)	ND (4)	ND (17)
Styrene	250	63	41	136
1,1,2,2-Tetrachloroethane	ND (2)	ND (1)	ND (0.4)	ND (1.4)
1,2-Dichlorobenzene	ND (0.7)	Tr, 1.7	ND (0.2)	Tr, 1.0
1,4-Dichlorobenzene	350	120	500	200
Xylene[c]	1,400	1,100	360	810
Ethylphenol	400	140	13	44

[a]Data for chloroform, benzene, toluene, chlorobenzene, ethylbenzene, xylene, ethylphenol, 1,1,2,2-tetrachloroethane and dichlorobenzene calculated by isotope dilution. Deuterated analogs of all compounds, with the exception of ethylphenol where deuterated ethylbenzene was used, were available as internal standards. All other compounds were quantitated versus the internal standard bromochloropropane (BCP).

[b]ND = not detected. Value signifies an estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).

[c]Two responses were quantitated, however, the specific isomers were not determined.

Table B-13. Summary of the Concentration (ng/g) of Target Volatile Organic Compounds in Composite Human Adipose Tissue Specimens Representing the East North Central (EN) Census Division

Census division	EN - East North Central							
Composite no.	(1)	(2)	(1)	(2)	(3)	(1)	(2)	(3)
Age group	0-14	0-14	15-44	15-44	15-44	45+	45+	45+
Compound[a]								
Chloroform	44	19	580	82	8.0	9.7	7.5	Tr, 1.4
1,1,1-Trichloroethane	ND (42)[b]	ND (24)	ND (37)	100	ND (23)	ND (48)	ND (10)	60
Bromochloromethane	ND (120)	ND (81)	ND (110)	ND (180)	ND (91)	ND (140)	ND (39)	ND (84)
Benzene	10	18	8.7	22	4.0	14.5	10	ND (4)
Tetrachloroethene	56	ND (2.9)	ND (16)	60	15	ND (20)	85	18
Dibromochloromethane	ND (12)	ND (8)	ND (11)	ND (18)	ND (4)	ND (14)	ND (4)	ND (4)
1,1,2-Trichloroethane	ND (9)	ND (4)	ND (8)	ND (9)	ND (3)	ND (10)	ND (2)	ND (3)
Toluene	28	19	35	26	9	52	250	15
Chlorobenzene	2.4	2.1	6.3	1.4	2.1	1.6	1.9	5.6
Ethylbenzene	130	60	96	30	22	49	42	34
Bromoform	ND (36)	ND (6)	ND (32)	ND (9)	ND (0.4)	ND (4)	ND (0.4)	ND (4)
Styrene	250	37	131	81	46	115	61	61
1,1,2,2-Tetrachloroethane	ND (0.1)	ND (5)	1.9	ND (0.5)	ND (0.3)	ND (0.3)	ND (0.3)	ND (0.3)
1,2-Dichlorobenzene	6.4	Tr, 0.6	Tr, 1.0	Tr, 0.9	ND (0.1)	Tr, 0.9	ND (0.4)	Tr, 0.8
1,4-Dichlorobenzene	40	87	240	100	100	100	230	110
Xylene[c]	610	270	510	200	140	240	250	230
Ethylphenol	91	55	39	92	10	33	8	27

[a]Data for chloroform, benzene, toluene, chlorobenzene, ethylbenzene, xylene, ethylphenol, 1,1,2,2-tetrachloroethane, and dichlorobenzene calculated by isotope dilution. Deuterated analogs of all compounds, with the exception of ethylphenol where deuterated ethylbenzene was used, were available as internal standards. All other compounds were quantitated versus the internal standard bromochloropropane (BCP).

[b]ND = not detected. Value in parenthesis signifies an estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).

[c]Two responses were quantitated, however, the specific isomers were not determined.

Table B-14. Summary of the Concentration (ng/g) of Target Volatile Organic Compounds in Composite Human Adipose Tissue Specimens Representing the Middle Atlantic (MA) Census Division

Census division	MA - Middle Atlantic					
Composite no.	(1)	(2)	(1)	(2)	(1)	(1)
Age group	0-14	0-14	15-44	15-44	45+	45+
Compound[a]						
Chloroform	6.4	7.7	6.4	79	14	Tr, 5.6
1,1,1-Trichloroethane	ND (17)[b]	ND (19)	97	30	ND (28)	ND (30)
Bromodichloromethane	ND (37)	ND (39)	ND (40)	ND (91)	ND (61)	ND (100)
Benzene	6.4	11	8	25	13	15
Tetrachloroethene	49	16	75	30	94	46
Dibromochloromethane	ND (10)	ND (4)	ND (10)	ND (9)	ND (15)	ND (10)
1,1,2-Trichloroethane	ND (5)	ND (3)	ND (6)	ND (5)	ND (9)	ND (5)
Toluene	4.4	Tr, 0.7	6.8	9.1	14	ND (0.2)
Chlorobenzene	2.0	0.6	2.4	6.7	3	2.5
Ethylbenzene	8.4	6.6	14	12	14	0.1
Bromoform	ND (5)	ND (4)	ND (6)	ND (8)	ND (9)	ND (8)
Styrene	41	44	39	39	45	42
1,1,2,2-Tetrachloroethane	ND (0.3)	ND (0.4)	ND (0.4)	ND (0.4)	ND (1)	ND (0.6)
1,2-Dichlorobenzene	Tr, 1.4	Tr, 0.3,	Tr, 1.1	Tr, 1.4	Tr, 1.4	Tr, 0.8
1,4-Dichlorobenzene	30	24	18	320	59	220
Xylene[c]	19	28	57	52	54	41
Ethylphenol	21	47	66	68	120	31

[a]Data for chloroform, benzene, toluene, chlorobenzene, ethylbenzene, xylene, ethylphenol, 1,1,2,2-tetrachloroethane, and dichlorobenzene calculated by isotope dilution. Deuterated analogs of all compounds, with the exception of ethylphenol where deuterated ethylbenzene was used, were available as internal standards. All other compounds were quantitated versus the internal standard bromochloropropane (BCP).

[b]ND = not detected. Value in parenthesis signifies an estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).

[c]Two responses were quantitated, however, the specific isomers were not determined.

Table B-15. Summary of the Concentration (ng/g) of Target Volatile Organic Compounds in Composite Human Adipose Tissue Specimens Representing the West North Central (WN) Census Division

Census division	WN - West North Central			
Composite no.	(1)	(1)	(2)	(2)
Age group	0-14	15-44	45+	45+
Compound[a]				
Chloroform	ND (2)	14	7.0	13
1,1,1-Trichloroethane	ND (24)[b]	ND (22)	27	ND (22)
Bromodichloromethane	ND (50)	ND (43)	ND (48)	ND (87)
Benzene	4.8	16	4.6	6.5
Tetrachloroethene	27	18	37	32
Dibromochloromethane	ND (7)	ND (7)	ND (0.9)	ND (9)
1,1,2-Trichloroethane	ND (5)	ND (4)	ND (1)	ND (4)
Toluene	8.0	19	6	3
Chlorobenzene	1.1	0.9	0.9	1.7
Ethylbenzene	17	46	7.4	29
Bromoform	ND (5)	ND (4)	ND (2)	ND (4)
Styrene	16	28	8	30
1,1,2,2-Tetrachloroethane	ND (0.1)	ND (0.1)	ND (0.1)	ND (5)
1,2-Dichlorobenzene	Tr, 0.4	ND (0.5)	1.9	ND (0.4)
1,4-Dichlorobenzene	58	22	51	16
Xylene[c]	79	81	27	81
Ethylphenol	72	5	Tr, 0.4	7

[a]Data for chloroform, benzene, toluene, chlorobenzene, ethylbenzene, xylene, ethylphenol, 1,1,2,2-tetrachloroethane and dichlorobenzene calculated by isotope dilution. Deuterated analogs of all compounds, with the exception of ethylphenol where deuterated ethylbenzene was used, were available as internal standards. All other compounds were quantitated versus the internal standard bromochloropropane (BCP).

[b]ND = not detected. Value in parenthesis signifies an estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).

[c]Two responses were quantitated, however, the specific isomers were not determined.

Table B-16. Summary of the Concentration (ng/g) of Target Volatile Organic Compounds in Composite Adipose Tissue Specimens Representing the South Atlantic (SA) Census Division

Census division	SA - South Atlantic									
Composite no.	(1)	(2)	(1)	(2)	(3)	(1)	(2)	(3)	(4)	(4)
Age group	0-14	0-14	15-44	15-44	15-44	45+	45+	45+	15-44	45+
Compound[a]										
Chloroform	140	110	59	8.0	300	42	36	58	ND (4)	ND (27)
1,1,1-Trichloroethane	ND (45)[b]	40	36	24	99	27	91	270	ND (53)	ND (52)
Bromodichloromethane	ND (150)	ND (200)	ND (60)	ND (120)	ND (140)	ND (100)	ND (50)	ND (110)	ND (130)	ND (130)
Benzene	15	6	14	6.4	10	22	3.3	7.2	7.9	3.7
Tetrachloroethene	ND (30)	ND (3)	72	Tr, 6	Tr, 6	ND (20)	3	29	34	ND (7)
Dibromochloromethane	ND (4)	ND (10)	ND (1)	ND (6)	ND (11)	ND (3)	ND (3)	ND (9)	ND (11)	ND (10)
1,1,2-Trichloroethane	ND (4)	ND (8)	ND (1)	ND (5)	ND (8)	ND (3)	ND (2)	ND (6)	ND (8)	ND (8)
Toluene	29	ND (0.2)	38	1.2	41	29	12	33	34	ND (0.4)
Chlorobenzene	21	2.0	12	4.4	6.9	ND (3)	2.3	1.8	1.7	ND (1)
Ethylbenzene	68	210	90	80	180	84	73	120	67	Tr, 2.0
Bromoform	ND (8)	ND (10)	ND (2)	ND (6)	ND (11)	ND (3)	ND (3)	ND (9)	ND (11)	ND (10)
Styrene	100	180	72	70	323	78	65	120	73	9.5
1,1,2,2-Tetrachloroethane	ND (0.2)	ND (0.6)	ND (0.1)	ND (0.3)	ND (4)	ND (0.1)	ND (0.3)	ND (0.5)	ND (0.6)	Tr, 0.4
1,2-Dichlorobenzene	ND (0.8)	Tr, 0.96	ND (0.5)	Tr, 1.2	ND (1)	ND (0.7)	0.4	ND (0.1)	ND (0.4)	ND (0.6)
1,4-Dichlorobenzene	95	190	59	60	350	97	170	250	400	16
Xylene[c]	290	230	530	370	920	520	310	640	380	18
Ethylphenol	370	200	37	52	76	56	12	54	63	33

[a]Data for chloroform, benzene, toluene, chlorobenzene, ethylbenzene, xylene, ethylphenol, 1,1,2,2-tetrachloroethane and dichlorobenzene calculated by isotope dilution. Deuterated analogs of all compounds, with the exception of ethylphenol where deuterated ethylbenzene was used, were available as internal standards. All other compounds were quantitated versus the internal standard bromochloropropane (BCP).

[b]ND = not detected. Value in parenthesis signifies an estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).

[c]Two responses were quantitated, however, the specific isomers were not determined.

Table B-17. Summary of the Concentration (ng/g) of Target Volatile Organic Compounds in Composite Human Adipose Tissue Specimens Representing the Pacific (PA) Census Division

Census division	PA - Pacific		
Composite no.	(1)	(1)	(1)
Age group	0-14	15-44	45+
Compound[a]			
Chloroform	75	Tr, 5.7	Tr, 2.4
1,1,1-Trichloroethane	280	100	ND (14)[b]
Bromodichloromethane	ND (53)	ND (130)	ND (53)
Benzene	9.0	13	8.2
Tetrachloroethene	ND (4)	11	Tr, 5.5
Dibromochloromethane	ND (3)	ND (13)	ND (5)
1,1,2-Trichloroethane	ND (20)	ND (13)	ND (5)
Toluene	11	20	13
Chlorobenzene	2	2.3	1.0
Ethylbenzene	ND (3)	39	28
Bromoform	ND (20)	ND (13)	ND (5)
Styrene	50	140	50
1,1,2,2-Tetrachloroethane	ND (0.7)	ND (1)	ND (0.5)
1,2-Dichlorobenzene	Tr, 0.6	4.2	Tr, 0.5
1,4-Dichlorobenzene	110	17	15
Xylene[c]	24	46	30
Ethylphenol	48	32	17

[a]Data for chloroform, benzene, toluene, chlorobenzene, ethylbenzene, xylene, ethylphenol, 1,1,2,2-tetrachloroethane and dichlorobenzene calculated by isotope dilution. Deuterated analogs of all compounds, with the exception of ethylphenol where deuterated ethylbenzene was used, were available as internal standards. All other compounds were quantitated versus the internal standard bromochloropropane (BCP).

[b]ND = not detected. Value in parenthesis signifies an estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).

[c]Two responses were quantitated, however, the specific isomers were not determined.

Table B-18. Summary of the Concentration (ng/g) of Target Volatile Organic Compounds in Composite Human Adipose Tissue Specimens Representing the New England (NE) Census Division

Census division	NE - New England			
Composite no.	(1)	(1)	(1)	(1)
Age group	0-14	15-44[b]	15-44 (repeat)	45+
Compound[a]				
Chloroform	Tr, 3.5	Tr, 3	Tr, 2.5	6.3
1,1,1-Trichloroethane	ND (22)[c]	ND (19)	17	ND (110)
Bromodichloromethane	ND (110)	ND (93)	ND (180)	ND (310)
Benzene	59	25	27	20
Tetrachloroethane	ND (4)	ND (3)	ND (6)	ND (31)
Dibromochloromethane	ND (14)	ND (9)	ND (18)	ND (20)
1,1,2-Trichloroethane	ND (11)	ND (9)	ND (18)	ND (20)
Toluene	22	42	51	15
Chlorobenzene	2	4.2	40	2.4
Ethylbenzene	145	72	89	67
Bromoform	ND (11)	ND (9)	ND (18)	ND (12)
Styrene	110	170	160	124
1,1,2,2-Tetrachloroethane	ND (1)	b	ND (1)	ND (0.8)
1,2-Dichlorobenzene	Tr, 1.0	b	Tr, 1	ND (0.4)
1,4-Dichlorobenzene	23	b	110	12
Xylene[cd]	190	350	480	380
Ethylphenol	120	38	180	150

[a]Data for chloroform, benzene, toluene, chlorobenzene, ethylbenzene, xylene, ethylphenol, 1,1,2,2-tetrachloroethane and dichlorobenzene calculated by isotope dilution. Deuterated analogs of all compounds, with the exception of ethylphenol where deuterated ethylbenzene was used, were available as internal standards. All other compounds were quantitated versus the internal standard bromochloropropane (BCP).

[b]The HRGC/MS analysis was interrupted before the sample analysis was completed.

[c]ND = not detected. Value in parenthesis signifies an estimated detection limit. Tr signifies trace level between limit of detection (LOD) and limit of quantitation (LOQ).

[d]Two responses were quantitated, however, the specific isomers were not determined.

APPENDIX C

COMPOSITING SCHEME FOR THE NHATS FY82 SPECIMENS

COMPOSITING SCHEME

The NHATS FY82 specimens were composited according to a scheme provided by the OTS Design and Development Branch (DDB) prime contractor, Battelle Columbus Laboratories (BCL). The following tables provide the details of the actual compositing effort. Composites for semivolatile organic analysis were completed first. Thus, many of the specimens identified by BCL were depleted before the volatile composite was prepared.

The aliquot for each individual specimen added to the composites is specified and the approximate mass of each individual specimen remaining after compositing is listed. Most samples contain up to 20 g total adipose tissue. However, two samples (WS - Composite 1, 0-14 yr and MO - Composite 1, 0-14 yr) consist of only 5-10 g total. This is a result of the very small sample sizes that were available. Many of the samples for the MO census division could not be located in the repository. The notation, NS, indicates no sample was found.

One error in the actual compositing should be noted. Sample 8202780 was included in the WS Composite 1, 45 plus sample instead of the 15-44 composite as specified in the BCL plan.

Census Division = PA, Age Group = 0-14 Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8206310	3.1	0.8	0
8206336	2.9	3.2	3
8206344	2.4	0	0
8206351	2.8	3.2	1.0
8206294	2.7	2.9	1.5
8206328	2.9	2.3	0
8206369	2.9	2.6	0
Total composite (g)	19.7	15.0	

Date composited: 2/27/84

Census Division = PA, Age Group = 15-44 Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8206153	2.2	2.2	4
8206195	2.6	2.2	4
8206229	2.8	2.2	4
8206419	2.4	2.6	3
8206211	2.2	1.1	2
8206237	2.3	2.3	4
8206245	2.3	2.2	3
8206260	2.6	2.6	4
8206203	2.2	0	0
Total composite (g)	21.6	17.4	

Date composited: 2/27/84

Census Division = PA, Age Group = 45 + Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8206278	1.3	1.3	25
8206286	1.3	1.5	10
8206302	1.1	1.7	15
8206435	1.8	1.3	20
8205346	1.9	1.3	10
8205353	1.6	1.1	5
8205361	1.7	1.5	.5
8206252	1.5	1.4	20
8206377	1.2	1.4	15
8206385	1.2	1.2	10
8206393	1.4	1.8	15
8205387	1.2	1.6	15
8206401	1.8	1.3	10
8206427	1.4	0.9	25
8206443	1.6	1.4	10
Total composite (g)	22.0	20.7	

Date composited: 2/27/84

Census Division = NE, Age Group = 0-14 Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8110678	0.8	1.5	3
8110686	0.9	1.1	1
8110710	0.9	1.6	3
8110736	1.5	1.4	3
8110744	1.3	1.2	0
8110751	1.4	0.5	0
8111072	1.1	1.2	1
8303737	NS	NS	NS
8303794	0.9	1.2	0.5
8110975	1.4	0.9	3
8111007	1.2	1.4	5
8111015	1.2	1.4	7
8111049	1.2	1.0	4
8111098	1.4	1.1	1
8303778	1.2	1.3	4
8303711	1.5	1.9	3
8303919	1.2	1.3	7
Total composite (g)	19.1	20.0	

Date composited: 2/27/84

Census Division = NE, Age Group = 15-44 Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8110660	1.0	1.0	5
8110728	1.0	1.2	3
8110769	1.0	1.0	4
8110777	1.1	1.0	4
8110785	1.0	1.0	4
8110793	1.1	1.3	5
8110801	1.1	1.1	2
8303661	1.0	1.0	2
8303679	1.1	1.1	3
8303687	1.1	1.1	3
8303729	NS	NS	NS
8303810	1.0	1.0	2
8303927	1.0	1.1	5
8110827	1.1	1.7	1
8110983	1.0	1.0	2
8110991	1.2	1.0	2
8111031	1.1	1.1	2
8111056	1.2	1.1	2
8111064	0.8	1.3	2
8111080	1.0	1.1	2
8303802	1.0	1.2	3
8303851	NS	NS	NS
8110702	1.0	1.2	2
8303893	NS	NS	NS
Total composite (g)	21.9	23.6	

Date composited: 2/27/84

Census Division = NE, Age Group = 45 + Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8110819	1.2	1.0	3
8110835	1.3	1.5	5
8110843	1.2	1.3	3
8110876	1.3	1.3	5
8110884	1.3	1.5	4
8110934	1.8	1.4	5
8110959	2.0	1.6	3
8111023	1.1	1.0	7
8303752	NS	NS	NS
8303828	1.2	1.0	6
8303877	NS	NS	NS
8110694	1.2	1.6	7
8110850	1.0	1.3	1
8110868	1.2	1.8	3
8110892	2.2	1.0	6
8110900	1.5	1.2	3
8110918	1.6	1.6	2.5
8110926	2.2	1.9	2
8110942	1.1	1.4	6
8110967	1.3	1.3	8
8303836	1.0	0.8	2
Total composite (g)	26.7	25.5	

Date composited: 2/27/84

Census Division = MA, Age Group = 0-14 Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8205023	0.7	0	0
8205031	0.9	0	0
8205049	0.5	0	0
8201790	2.5	3.0	25
8201808	2.7	3.0	20
8206062	2.8	2.6	20
8206088	3.0	3.1	20
8206187	3.0	3.0	25
8201485	2.8	2.6	20
8206021	3.1	3.0	20
8110595	NS	NS	NS
8110652	NS	NS	NS
8205007	1.0	0	0
8300006	NS	NS	NS
Total composite (g)	23.0	20.3	

Date composited: 2/28/84

Census Division = MA, Age Group = 15-44 Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8201584	1.0	1.1	10
8201659	1.1	1.2	10
8205965	1.1	1.0	5
8205999	1.1	1.2	5
8206013	1.0	1.1	10
8203143	1.0	0.7	3
8203176	1.0	1.0	5
8203358	1.1	1.2	10
8203366	1.0	1.4	5
8203374	1.0	1.1	10
8201642	1.0	1.1	10
8201832	0.9	1.0	10
8205817	1.0	1.1	10
8205833	1.2	1.2	10
8205841	0.9	0.9	5
8205882	1.1	1.1	10
8206161	1.0	0.9	10
8203168	1.1	1.0	10
8203226	1.2	1.0	5
8203325	1.0	1.0	10
8205973	1.1	1.1	10
8203408	1.0	0.4	2
8201543	1.1	1.2	2
8205858	1.2	1.0	5
Total composite (g)	25.2	25.0	

Date composited: 2/28/84

Census Division = MA, Age Group = 45 + Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8201469	0.7	0.7	20
8201501	0.9	1.0	25
8201576	0.9	0.9	15
8201675	0.6	1.0	25
8201717	0.9	0.7	25
8201782	1.0	0.9	20
8203135	0.9	0.8	20
8203184	0.7	0.7	15
8203291	0.9	0.8	20
8203341	0.8	0.9	25
8300584	NS	NS	NS
8201451	0.8	0.7	25
8201519	0.8	1.0	25
8201535	0.9	0.9	20
8201600	0.7	0.7	25
801667	0.7	0.8	25
8203192	0.7	0.8	20
8203317	0.7	0.8	25
8300600	NS	NS	NS
8300618	NS	NS	NS
8300642	NS	NS	NS
8207185	1.0	0.8	15
8201816	0.8	0.6	25
8300444	NS	NS	NS
8201447	0.8	0.8	-
Total composite (g)	16.2	16.3	

Date composited: 2/28/84

Census Division = MA, Age Group = 0-14 Years, Composite 2

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8300030	NS	NS	NS
8201550	1.6	1.6	15
8201691	1.4	1.5	25
8206104	1.3	1.5	20
8206112	1.5	1.3	20
8206120	1.4	1.5	20
8206179	1.2	1.2	10
8206005	1.2	1.2	20
8206039	2.4	1.7	20
8206047	1.5	1.4	25
8206054	1.7	2.3	15
8205056	1.1	0	0
8206070	2.5	1.4	20
8201626	1.4	1.5	25
Total composite (g)	20.2	18.1	

Date composited: 2/29/84

Census Division = MA, Age Group = 15-44 Years, Composite 2

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8201634	1.3	1.2	10
8201824	1.1	1.1	10
8205890	1.6	1.2	10
8205916	1.3	1.6	10
8205924	1.1	1.2	10
8205932	1.4	1.1	10
8205940	1.1	1.3	10
8205957	1.2	1.0	10
8205981	1.3	1.4	10
8203267	0.6	0.6	5
8205791	1.2	1.0	10
8205825	1.1	1.3	10
8205866	1.5	1.2	10
8205874	1.2	1.3	10
8206146	1.2	1.0	10
8203127	1.1	0.9	5
8203218	1.0	1.0	10
8203234	1.0	1.0	10
8203333	1.6	1.2	8
8201840	1.1	1.2	10
8203283	1.0	1.0	5
8206138	1.1	1.5	10
Total composite (g)	26.1	25.3	

Date composited: 2/29/84

Census Division = MA, Age Group = 45 + Years, Composite 2

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8201493	0.8	0.8	20
8201568	0.8	0.8	25
8201592	0.7	0.8	25
8201709	0.8	0.9	25
8201725	0.7	1.0	25
8201774	0.8	1.0	20
8203150	0.8	0.7	25
8203259	0.8	0.7	15
8300451	NS	NS	NS
8300485	NS	NS	NS
8201618	1.2	0.8	20
8201733	0.7	0.7	25
8201758	1.2	1.1	25
8201766	1.3	1.0	25
8201857	1.4	0.6	20
8203200	0.9	1.0	20
8203275	0.8	0.7	20
8203382	0.9	1.2	20
8203424	0.8	0.9	20
8300568	NS	NS	NS
8300634	NS	NS	NS
8300659	NS	NS	NS
8201527	0.9	0.9	20
8201683	1.0	1.4	25
8203309	0.7	0.8	25
Total composite (g)	18.0	17.8	

Date composited: 3/1/84

Census Division = EN, Age Group = 0-14 Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8201246	1.3	1.4	5
8203101	1.0	0	0
8207979	1.5	1.1	1
8206864	1.0	1.2	5
8206930	1.2	1.2	5
8200065	0.8	0	0
8200230	0.6	0	0
8200354	0.5	0	0
8201360	1.1	1.1	2
8203077	1.4	0.8	0
8203119	1.0	1.0	1
8200214	1.0	1.2	0
8203416	1.0	0.5	0
8210189	1.0	1.5	0.5
8210247	NS	NS	NS
8203010	1.2	0.9	2
8203465	0.8	0	0
8210205	NS	NS	NS
8210403	0.9	0.8	1
8210379	0.8	0	0
Total composite (g)	18.1	12.7	

Date composited: 2/28/84

Census Division = EN, Age Group = 15-44 Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8201162	0.8	0.9	5
8201170	1.2	1.1	10
8201188	1.0	0.9	5
8201238	0.9	0.9	10
8201345	0.9	1.1	15
8203630	0.9	1.1	5
8205288	1.3	0.9	2
8200297	1.1	1.4	2
8210171	0.9	1.1	5
8201352	1.2	0.9	10
8201386	1.1	1.4	10
8201436	0.8	1.1	15
8203028	2.2	3.3	2
8205163	0.8	0.7	10
8200370	1.0	0.8	0
8200388	0.8	1.0	3
8203432	0.9	0.8	10
8203499	1.3	0.5	0
8210346	NS	NS	NS
8200081	1.2	0	0
8210270	1.3	0.9	4
Total composite (g)	21.6	20.8	

Date composited: 2/28/84

Census Division = EN, Age Group = 45 + Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8201287	1.2	1.1	10
8201378	1.1	1.1	5
8201410	1.4	1.2	5
8203051	1.1	1.2	5
8205148	1.0	1.0	2
8200313	1.1	1.1	10
8200487	1.0	1.4	2
8200503	1.3	1.0	2
8207201	1.0	1.0	5
8201212	1.1	1.0	5
8205171	1.1	1.1	5
8205320	1.0	1.1	5
8200438	1.0	1.0	1
8200453	1.3	1.0	2
8200461	1.0	1.0	2
8210148	NS	NS	NS
8210353	1.0	0.1	0
8207243	1.0	1.1	10
8210320	1.1	1.1	2
Total composite (g)	19.8	18.6	

Date composited: 2/28/84

Census Division = EN, Age Group = 0-14 Years, Composite 2

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8207961	1.5	1.4	2
8206922	1.0	1.1	4
8205304	0.9	0	0
8203085	1.8	2.0	0
8207953	1.1	1.0	5
8206880	1.2	1.2	1
8206856	1.1	1.6	2
8206872	1.2	0.6	1
8200396	1.1	0.3	0
8203440	1.1	1.1	1
8210221	0.2	0	0
8206914	1.0	0.9	4
8200040	1.1	0	0
8200404	0.9	1	1
8210254	0.9	0	0
8210288	NS	NS	NS
8210411	1.1	1.2	1
8203036	1.1	1.2	1
8203069	0.6	0.8	1
8200412	1.3	1.0	5
8203457	1.0	0.9	1
Total composite (g)	21.2	17.3	

Date composited: 3/1/84

Census Division = EN, Age Group = 15-44 Years, Composite 2

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8201204	1.1	1.1	10
8201311	1.1	1.1	10
8201428	1.2	1.0	20
8200255	1.4	0.8	2
8200271	1.5	1.1	8
8203507	NS	NS	NS
8210262	1.4	1.4	4
8210296	NS	NS	NS
8207169	1.0	0.9	7
8201337	1.1	0.9	20
8201394	1.0	1.0	20
8203002	1.0	1.5	20
8205254	1.0	1.0	4
8205270	0.9	1.2	3
8200339	1.0	0.9	10
8203481	1.0	1.0	10
8210387	1.2	1.0	20
8207177	0.7	1.2	20
8207235	1.1	1.4	15
8200511	1.6	1.2	0
8205155	1.1	1.4	10
Total composite (g)	21.4	21.1	

Date composited: 3/1/84

Census Division = EN, Age Group = 45 + Years, Composite 2

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8201220	1.7	1.8	5
8201261	1.7	1.6	5
8201279	1.8	1.5	10
8201444	1.5	1.7	5
8205106	1.3	1.3	4
8205239	1.0	1.5	1
8302853	1.7	1.4	5
8200115	1.4	1.2	4
8200156	1.6	1.5	2
8207946	1.1	0.5	5
8205189	1.2	1.6	2
8205205	1.6	1.3	2
8200420	1.0	0	0
8200446	1.6	1.4	3
8210163	NS	NS	NS
8210213	1.6	1.6	2
8210395	1.7	1.6	2
8205130	1.4	1.1	2
8203507	1.3	0	0
Total composite (g)	26.2	22.6	

Date composited: 3/1/84

Census Division = EN, Age Group = 15-44 Years, Composite 3

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8201295	1.2	1.5	10
8206898	1.0	1.6	15
8205114	1.1	0.9	10
8205197	1.7	1.1	6
8205262	1.0	0.8	6
8302838	1.2	1.1	6
8200131	0.4	0	0
8200172	1.0	0.8	0
8210155	1.1	1.1	10
8210239	NS	NS	NS
8201196	0.9	0.8	6
8203044	1.2	1.0	4
8206831	1.3	1.5	10
8205296	0.9	1.0	6
8200198	1.2	0.8	1
8203473	1.0	1.1	4
8210130	NS	NS	NS
8210361	NS	NS	NS
8207193	1.3	1.4	10
8207268	1.0	1.1	20
8210338	0.9	1.2	15
8207136	0.8	0.8	20
Total composite (g)	20.2	19.6	

Date composited: 3/1/84

Census Division = EN, Age Group = 45 + Years, Composite 3

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8201329	1.9	1.5	8
8205213	1.6	1.3	2
8205221	1.8	1.5	8
8200495	0.8	0	0
8210197	NS	NS	NS
8210304	NS	NS	NS
8210312	1.9	1.7	2
8207151	2.3	2.0	5
8207227	1.7	1.9	5
8201253	1.6	1.6	5
8201303	1.6	1.6	5
8201402	1.4	1.8	2
8205122	1.4	1.5	0
8205247	1.6	2.2	0.5
8302820	NS	NS	NS
8200479	1.6	1.3	2
8207219	2.0	1.5	8
Total composite (g)	23.2	21.4	

Date composited: 3/1/84

Census Division = WN, Age Group = 0-14 Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8201980	1.0	1.5	1
8205478	2.0	2.4	2.5
8205551	1.4	1.1	0
8205577	1.1	0	0
8205619	2.0	0	0
8205635	2.0	2.4	5
8205668	2.5	1.8	5
8205569	2.5	3.5	3
8205684	1.3	2.7	1.0
8205692	1.5	0	0
8205734	2.0	1.5	1
8205783	2.3	1.1	0
8201949	1.8	0.9	0
Total composite (g)	23.4	18.9	

Date composited: 2/28/84

Census Division = WN, Age Group = 15-44 Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8202012	1.2	1.6	10
8210833	0.9	1.0	20
8205486	0.9	1.2	10
8205536	1.4	1.9	7
8205544	1.1	1.3	7
8205585	1.1	1.0	10
8205601	1.1	0.9	8
8205643	1.1	1.2	6
8205676	1.2	1.5	1
8205718	1.2	1.5	4
8205742	1.7	1.7	2
8210759	1.2	1.1	10
8205593	1.2	1.0	5
8205627	1.6	1.2	20
8205700	1.3	1.0	10
8205759	1.2	1.1	10
8205767	1.2	1.4	5
Total composite (g)	20.6	21.6	

Date composited: 2/29/84

Census Division = WN, Age Group = 45 + Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8201964	1.7	1.5	10
8202004	1.6	1.7	5
8210783	1.5	1.5	5
8210841	1.5	1.6	10
8205429	1.7	1.4	5
8205452	1.7	1.6	5
8205502	1.1	1.3	5
8205510	1.5	1.5	5
8201998	1.2	1.1	5
8210791	1.4	1.1	5
8205395	1.8	1.8	1
8205403	1.6	1.9	5
8205437	1.5	1.6	2
8205445	1.7	1.0	2
8205650	1.0	1.0	2
Total composite (g)	22.5	21.6	

Date composited: 2/28/84

Census Division = WN, Age Group = 45 + Years, Composite 2

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8201956	1.4	1.2	5
8202038	1.4	1.3	15
8202053	1.6	1.5	15
8210817	1.3	1.3	5
8205411	1.3	1.1	5
8205494	1.2	1.2	9
8205809	1.3	1.1	0
8201972	1.4	1.4	8
8202020	1.4	1.1	6
8202046	1.5	1.2	10
8210767	1.3	1.3	5
8205460	1.6	1.1	8
8205528	1.4	1.2	10
8205775	1.3	1.3	15
8205726	2.0	1.0	2
Total composite (g)	21.4	18.3	

Date composited: 2/28/84

Census Division = SA, Age Group = 0-14 Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8201113	1.0	1.0	10
8303042	1.4	1.6	0.5
8202145	1.2	0	0
8204059	1.3	0	0
8202277	0.9	0.9	4
8203572	1.2	1.4	0.5
8203978	0.9	0	0
8202327	1.4	0.8	10
8202343	1.1	1.5	1
8202426	0.9	1.7	4
8200149	1.1	0.7	0
8200222	0.6	0	0
8203986	1.3	0.3	0
8202350	0.8	0.8	15
8201089	1.3	1.0	2.5
8202129	0.8	0	0
8202160	0.9	0	0
8202194	0.8	0	0
8203952	0.8	0	0
8202244	1.0	0.9	15
Total composite (g)	20.7	12.6	

Date composited: 2/29/84

Census Division = SA, Age Group = 15-44 Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8203515	1.0	1.0	10
8203671	1.3	0	0
8203762	1.1	0	0
8203796	1.1	0.9	2
8203853	1.0	0.9	1
8202269	1.1	1.1	10
8202509	0.9	1.0	2
8207003	0.8	0.9	1
8201105	0.9	0.8	10
8203895	1.1	1.0	5
8203929	1.5	1.1	0
8204000	0.9	0.7	0.5
8202251	1.0	0.7	2
8202616	0.8	0.8	5
8207086	0.9	1.5	0
8203606	0.8	0.8	3
8201139	1.0	0.8	4
8201147	0.8	1.3	2
8203788	1.0	0.9	2
8203820	0.9	0.9	1
8208316	0.9	0.8	1
8110041	NS	NS	NS
8200206	1.3	0.6	0
8200248	0.8	0.7	0
8204042	1.0	1.4	0
8202434	1.1	1.2	10
8202525	1.4	1.0	4
Total composite (g)	26.4	22.8	

Date composited: 2/29/84

Census Division = SA, Age Group = 45 + Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8206963	0.8	0.7	4
8203556	0.8	0.7	10
8203580	0.7	0.6	6
8201014	0.7	0.6	6
8200073	0.6	0.6	0
8202186	0.5	0	0
8203747	0.6	0.8	0
8203879	0.5	0.6	0
8204034	0.6	0.7	7
8202384	0.7	0.7	20
8206989	0.9	1.2	10
8207037	0.6	0.7	6
3203598	1.4	0.9	15
8201055	0.9	0.8	6
8303083	NS	NS	NS
8203705	0.7	0.8	7
8203713	0.6	0.9	3
8208332	0.7	0.7	8
8202301	0.9	0.7	8
8207011	0.8	0.7	5
8110058	NS	NS	NS
8200164	1.2	0	0
8203655	1.0	0	0
8203721	0.8	0	0
8202210	1.0	0.6	15
8202392	1.0	0.6	20
8202558	1.0	0.8	10
8202632	NS	NS	NS
Total composite (g)	20.0	15.4	

Date composited: 2/29/84

Census Division = SA, Age Group = 0-14 Years, Composite 2

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8303257	1.8	1.6	2
8208506	0.3	0	0
8202368	1.6	2.1	5
8202533	1.2	2.3	1
8303273	1.2	1.2	1
8200305	1.0	0	0
8202079	1.2	0.6	0
8201121	2.3	1.9	1
8303232	1.8	1.5	0
8204018	0.6	0	0
8202285	1.7	1.7	5
8202376	1.6	1.5	8
8303067	1.1	0.8	0
8303091	1.7	1.5	0
Total composite (g)	19.1	16.7	

Date composited: 3/1/84

Census Division = SA, Age Group = 15-44 Years, Composite 2

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8207078	0.7	0.8	1
8302986	NS	NS	NS
8203887	0.8	0.9	0.5
8208472	1.0	0.7	0.5
8110025	NS	NS	NS
8201154	0.7	0.8	10
8202111	0.9	0.7	10
8203770	0.6	0.7	2
8207060	0.9	0.7	1
8207144	0.7	0.8	6
8203622	1.3	0.8	10
8200321	0.7	0.6	2
8203754	1.1	1.2	5
8202103	0.9	1.1	1
8203739	0.9	1.4	0
8202236	1.0	1.1	20
8202608	1.0	1.2	10
8202335	0.7	0.8	15
8202442	0.8	0.6	5
8208522	NS	NS	NS
8202459	1.0	0.6	20
8203994	1.0	0.6	0
8202400	1.1	0.8	15
8203804	1.0	0.9	1
8203911	0.7	0.9	4
Total composite (g)	19.5	18.7	

Date composited: 3/1/84

Census Division = SA, Age Group = 45 + Years, Composite 2

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8206971	1.2	1.1	2
8110033	NS	NS	NS
8202061	0.8	0.7	0
8207052	1.6	1.2	2
8203531	1.1	1.3	5
8201006	1.3	1.3	5
8203812	1.0	0.9	0
8203861	1.1	1.1	2
8208514	NS	NS	NS
8202483	1.6	1.4	5
8202574	1.4	1.1	10
8202178	1.1	1.4	1
8204026	1.1	0.9	1
8208480	1.2	1.2	5
8202202	1.3	1.0	8
8202467	1.1	0.9	8
8202590	1.2	1.3	5
8201022	1.6	1.3	10
8202137	1.1	0.4	0
8202152	1.3	1.0	1
8208399	1.3	1.2	2
8202418	1.3	1.3	10
8202624	1.4	1.2	5
Total composite (g)	26.1	23.2	

Date composited: 3/1/84

Census Division = SA, Age Group = 15-44 Years, Composite 3

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8203523	0.8	0.6	8
8203546	0.7	1.2	3
8201071	0.9	0.7	4
8202087	1.1	0.7	1
8203697	0.4	0	0
8208407	1.5	0	0
8109993	NS	NS	NS
8302937	0.9	0.8	8
8303240	1.3	0.6	5
8200362	1.1	0	0
8203937	1.2	0	0
8208365	0.6	0.7	0
8207110	0.7	0.9	6
8110066	NS	NS	NS
8303117	0.7	0.7	5
8202293	0.8	0.9	6
8202582	0.6	0.6	10
8303109	1.5	0.9	5
8200347	0.7	0	0
8203960	1.0	0	0
8202491	NS	NS	NS
8202517	1.4	0.8	10
Total composite (g)	17.9	10.1	

Date composited: 3/1/84

Census Division = SA, Age Group = 45 + Years, Composite 3

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8207029	1.7	0	0
8302960	2.7	2.2	2
8201048	2.0	2.3	0
8201063	2.0	2.5	2
8110009	NS	NS	NS
8200123	1.8	0.6	0
8202566	2.4	2.5	5
8201030	2.2	1.9	6
8303125	2.0	1.8	2
8203846	1.2	0	0
Total composite (g)	18.0	13.8	

Date composited: 3/1/84

Census Division = SA, Age Group = 15-44 Years, Composite 4

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8203838	1.3	0.6	0
8208415	NS	NS	NS
8202228	1.4	1.4	10
8207128	1.4	1.3	1
8203663	1.4	1.4	2
8202541	1.6	1.5	20
8207102	1.4	1.2	0
8302978	1.7	1.7	25
8203689	1.4	1.6	0.5
8202319	1.5	1.9	20
8303059	1.3	1.8	4
8208530	NS	NS	NS
8202475	2.0	1.9	15
8202491	1.8	1.5	20
Total composite (g)	18.2	17.8	

Date composited: 3/1/84

Census Division = SA, Age Group = 45 + Years, Composite 4

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8206955	5.3	4.5	0
8206948	3.3	0	0
8207045	3.0	2.6	0
8206997	4.9	4.5	0
8203945	1.1	0	0
Total composite (g)	17.6	11.6	

Date composited: 3/1/84

Census Division = ES, Age Group = 0-14 Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8200628	0.8	0	0
8200636	0.6	0.8	2
8200685	2.2	0.6	2
8200792	0.8	0.6	1
8200800	1.0	0.9	5
8200867	0.8	0.8	2
8201881	0.8	1.9	2
8201915	0.6	0.6	2
8204190	0.7	1.0	2
8204208	1.0	1.2	1
8204216	1.4	1.0	1
8204273	0.9	1.0	1
8204497	1.1	1.0	2
8200677	0.5	0.6	2
8200768	0.8	1.8	2
8200883	1.2	1.1	2
8201923	1.0	1.2	3
8201931	1.6	1.2	0
8204174	1.5	1.1	2
8204182	1.5	1.4	1
8204224	1.1	1.1	2
8204240	1.0	0.8	2
8204257	1.3	1.3	2
8204406	1.2	0.7	2
8200560	1.1	0.8	2
8204299	1.6	1.1	2
Total composite (g)	28.1	25.6	

Date composited: 2/29/84

Census Division = ES, Age Group = 15-44 Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8200586	1.2	1.1	20
8200727	1.3	1.2	6
8201865	1.3	1.3	6
8204232	1.0	1.4	2
8204281	1.3	1.1	4
8204430	1.0	1.1	3
8204554	1.3	1.5	3
8200610	1.1	1.0	4
8200719	1.7	0.3	4
8200818	1.1	1.2	10
8201873	1.3	1.2	10
8204265	1.0	1.1	3
8204307	1.3	1.2	2
8204323	1.4	1.4	4
8200750	1.5	1.4	5
8204489	1.1	1.5	5
Total composite (g)	19.9	19.0	

Date composited: 2/29/84

Census Division = ES, Age Group = 45 + Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8200644	1.1	1.3	5
8200669	1.2	1.2	4
8200735	1.1	1.0	2
8204398	1.2	1.4	2
8204414	1.4	1.4	2
8204448	1.3	1.3	2
8204455	1.4	1.0	2
8204463	1.2	1.2	2
8204513	1.2	1.2	2
8200552	1.2	1.1	2
8200776	1.1	1.0	3
8200784	1.4	1.6	4
8200834	1.4	1.2	5
8200875	1.0	1.0	2
8204422	1.2	1.2	2
8204521	1.2	1.2	2
8204547	1.1	1.3	3
Total composite (g)	20.7	20.6	

Date composited: 2/29/84

Census Division = ES, Age Group = 15-44 Years, Composite 2

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8200578	1.5	1.5	5
8200594	1.2	0.7	0
8200529	1.9	2.0	10
8200693	0.9	2.0	0
8200826	1.7	1.6	4
8204315	1.7	1.6	2
8204331	1.7	1.6	2
8204356	1.5	1.3	2
8204539	2.2	1.6	1
8204372	1.9	2.0	2
8200743	1.8	1.1	5
8200859	1.4	1.4	5
8200891	0.5	0.1	5
8201899	1.5	1.4	5
8204349	1.5	1.7	2
8204364	1.2	1.2	2
8204380	1.6	1.5	2
Total composite (g)	25.7	24.3	

Date composited: 3/1/84

Census Division = ES, Age Group = 45 + Years, Composite 2

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8200537	2.2	2.3	4
8200602	1.9	1.8	1
8200651	2.1	1.9	4
8200701	2.6	2.4	5
8200842	2.4	3.4	6
8200545	2.1	2.0	4
8204471	2.5	1.8	2
8204505	2.9	1.6	1
8204562	2.4	2.1	2
Total composite (g)	21.1	19.3	

Date composited: 3/1/84

Census Division = WS, Age Group = 0-14 Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8202848	1.2	1.2	2
8206773	1.1	1.1	0
8206781	0.3	0	0
8206799	0.6	0	0
8202798	1.8	1.6	3
8202897	1.2	1.4	3
8206757	1.2	0.7	0
8206807	0.3	0	0
8206849	0.5	0	0
8202889	NS	NS	NS
8206732	0.4	0	0
8206755	0.7	0	0
8206823	1.3	0	0
8206815	0.5	0	0
Total composite (g)	11.1	6.0	

Date composited: 2/29/84

Census Division = WS, Age Group = 15-44 Years, Composite 2

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8202640	1.7	1.3	25
8202723	0.9	0.8	3
8202772	1.0	0.8	1
8202988	1.5	1.1	8
8206625	0.9	1.4	25
8206690	0.8	1.7	8
8206708	1.8	1.2	15
8202665	1.2	0.9	25
8202756	1.7	1.0	0
8202780[a]	a	a	a
8202806	1.3	1.2	1
8202939	1.1	1.7	4
8206583	1.5	1.4	25
8206617	1.0	1.6	20
8206633	1.2	1.0	15
8206658	1.1	1.0	15
8202863	0.9	1.1	15
8202970	1.0	1.0	5
8202921	1.1	1.3	5
8202889	1.0	0.9	20
Total composite (g)	22.7	22.4	

Date composited: 2/29/84

[a]Sample included in the 45 + composite.

Census Division = WS, Age Group = 45 + Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8202681	0.8	0.8	4
8202699	0.9	0.9	9
8202749	1.1	1.0	8
8202814	0.8	0.8	3
8202830	0.9	1.0	5
8206450	0.9	1.1	5
8206500	0.9	1.0	5
8206526	1.0	0.8	5
8206724	1.1	0.9	10
8202657	1.2	1.0	8
8202673	0.9	1.0	8
8202707	0.9	1.0	5
8202715	0.9	0.8	8
8202731	1.1	0.9	5
8202855	0.9	0.9	4
8206484	1.3	1.4	8
8206534	1.0	0.9	9
8206542	1.1	1.0	10
8206567	0.9	0.8	10
8206716	0.9	1.0	8
8206641	0.9	1.0	9
8206609	1.0	1.0	8
8202780	1.0	1.0	8
Total composite (g)	22.4	22.0	

Date composited: 2/29/84

Census Division = WS, Age Group = 15-44 Years, Composite 2

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8202764	1.2	1.8	5
8202962	1.0	1.3	10
8206476	1.2	0.9	10
8206492	0.7	1.0	10
8206575	1.1	1.1	10
8206666	1.2	1.0	10
8206740	1.1	0.8	10
8202822	1.3	1.7	1
8202871	1.1	1.6	5
8202913	1.4	1.5	5
8202947	1.6	1.3	10
8206559	0.9	0.9	10
8206591	1.3	1.1	5
8206674	1.1	1.2	10
8206682	1.5	1.4	10
8202954	1.9	1.3	5
8202996	0.9	1.0	10
8206518	1.4	1.0	5
Total composite (g)	21.9	21.9	

Date composited: 3/1/84

Census Division = MO, Age Group = 0-14 Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8110199	0.8	0	0
8110207	2.6	2.4	1
8110256	1.0	0	0
8110272	0.2	0	0
8110116	2.4	2.7	8
8206468	1.3	0	0
8110157	0.7	0	0
Total composite (g)	9.0	5.1	

Date composited: 2/29/84

Census Division = MO, Age Group = 15-44 Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8110090	1.4	1.4	6
8110124	1.3	1.2	1
8110215	1.3	2.1	15
8110231	1.4	1.4	10
8110306	NS	NS	NS
8110397	NS	NS	NS
8204067	1.5	1.5	7
8204083	1.7	1.2	10
8204158	1.8	1.5	15
8110108	1.3	1.3	10
8110132	2.0	1.5	2.0
8110165	1.4	1.4	5
8110249	1.8	2.8	0
8110348	NS	NS	NS
8110363	NS	NS	NS
8110371	NS	NS	NS
8110488	NS	NS	NS
8204075	1.4	1.5	10
Total composite (g)	18.3	18.8	

Date composited: 2/29/84

Census Division = MO, Age Group = 45 + Years, Composite 1

FY 82 specimen no.	Semivolatile organic composite amount added (g)	Volatile organic composite amount added (g)	Approximate mass remaining (g)
8110140	2.0	2.2	5
8110173	2.0	2.7	0.5
8110181	2.2	2.0	4
8110330	NS	NS	NS
8110421	NS	NS	NS
8110439	NS	NS	NS
8110454	NS	NS	NS
8110462	NS	NS	NS
8204117	2.0	2.1	5
8204133	2.1	2.0	5
8204141	2.1	2.1	5
8204166	2.2	2.0	4
8110264	2.1	2.6	5
8110280	NS	NS	NS
8110298	NS	NS	NS
8110322	NS	NS	NS
8110389	NS	NS	NS
8110447	NS	NS	NS
8110470	NS	NS	NS
8204109	2.2	2.2	5
8204125	2.1	2.5	5
Total composite (g)	21.0	22.4	

Date composited: 2/29/84

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO. EPA-560/5-86-036	2.	3. RECIPIENT'S ACCESSION NO.
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7. AUTHOR(S) John S. Stanley		8. PERFORMING ORGANIZATION REPORT NO. 8821-A(01)
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15. SUPPLEMENTARY NOTES
J. Remmers and P. Robinson, Work Assignment Managers
J. Breen and C. Stroup, Program Managers

16. ABSTRACT

The U.S. EPA's Office of Toxic Substances (OTS) maintains a unique capability for monitoring human exposure to potentially toxic substances through the National Human Adipose Tissue Survey (NHATS). The primary focus for NHATS has been to document trends in human exposure to environmentally persistent contaminants, specifically organochlorine pesticides and polychlorinated biphenyls (PCBs).

EPA/OTS has recognized a need to expand the use of the NHATS program to provide a more comprehensive assessment of toxic substances that are accumulated in adipose tissue. This report deals specifically with the measurement of volatile organic chemicals in composited adipose tissue specimens from the FY82 NHATS repository.

Quantitative data are reported for 17 specific volatile compounds that are classified as aromatic, chlorinated aromatic, or halogenated aliphatic. The frequency of detection of each compound based on age group (0-14, 15-44, and 45 plus years) are detailed in the report. The analytical procedures and QA/QC efforts are also described.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Human Adipose Tissue Volatile Organic Compounds Purge and trap Dynamic headspace HRGC/MS	Analysis Determination	

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