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COOPERATIVE AGREEMENT NUMBER DAMD17-96-2-6015

TITLE: Female Reproductive Effects of Exposure to Jet Fuel at U.S. Air Force Bases

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REPORT DATE: November 1998

TYPE OF REPORT: Annual

PREPARED FOR: U.S. Army Medical Research and Materiel Command
Fort Detrick, Maryland 21702-5012

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	November 1998	Annual (15 Oct 97 - 14 Oct 98)

4. TITLE AND SUBTITLE
Female Reproductive Effects of Exposure to Jet Fuel at U.S. Air Force Bases

5. FUNDING NUMBERS
DAMD17-96-2-6015

6. AUTHOR(S)
Grace K. Lemasters, Ph.D.

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
University of Cincinnati
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8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
U.S. Army Medical Research and Materiel Command
Fort Detrick, Maryland 21702-5012

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

One of the most prevalent exposures at all Air Force (AF) bases is to jet fuel. Total consumption ranks in the billions of gallons. Jet fuel is composed of aliphatic/aromatic hydrocarbons and traces of metals that have potential adverse effects on health including menstrual disorders, infertility, spontaneous abortions, and fetal effects. The mean age of active enlisted female Air Force personnel is 27.6. This study addresses whether or not women are experiencing menstrual systems related to their workplace from fuel exposures. This study evaluates environmental and internal dose measurements of jet fuel components during the course of each woman's usual work activities. Great strides have been made thus far. The number of women in pertinent job activities at each base has been identified and base commanders have received letters of request. Ten bases, thus far, have agreed to participate and have been visited. We have encrolled 165 women into the study. This team also developed and refined a new technique to measure internal dose levels. Specifically, the breath data indicates concentrations of toluene and the xylenes to range in concentrations between 10 and over 100 ppb.

14. SUBJECT TERMS Defense Womens's Health Research Program
Epidemiology, Fuels, Breath Analysis, Hormones, Menses, Reproduction

15. NUMBER OF PAGES 38

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	Unlimited

FOREWORD

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__✓__ In the conduct of research involving hazardous organisms, the investigator(s) adhered to the CDC-NIH Guide for Biosafety in Microbiological and Biomedical Laboratories.

Grace Lemasters 10-30-98

PI - Signature Date

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BACKGROUND:

Introduction:

Jet fuel (JF) is one of the most common chemical exposures at all Air Force Bases. It constitutes at least two thirds of the turbine fuels used by the Department of Defense (DoD)[1]. Jet fuel consists of a variable mixture of hydrocarbon compounds whose specifications are based on burn characteristics, and additives used to inhibit icing, corrosion, and static. JP-8 is a turbine engine fuel recently replacing JP-4. JP-8 is a kerosene-based distillate with a higher flash point, higher chain hydrocarbons and no/lower benzene; it is, therefore, presumed to be safer to use than its JP-4 predecessor.

The reproductive and developmental toxicity of the complex streams that comprise fuels has not yet been established [2,3]. The literature does, however, contain both animal and human studies of exposure to various fuels and primary fuel components. While the paraffins and olefins, with the exception of n-hexane, are believed to be nontoxic at low doses, certain organic compounds in fuels and emissions are known or suspected human reproductive or developmental toxicants[4].

Hypothesis and Technical Objectives:

The primary null hypothesis of this study is that there will be no statistically significant difference in hormonal patterns and menstrual function between women exposed to jet fuel and an unexposed group. The secondary null hypothesis is that there will be no significant racial differences in either internal dose or reproductive health response to JF exposure.

A. **Technical Objective 1** - To identify and recruit 100 JF-exposed women (50 Caucasians, 50 minority) and 100 unexposed women group-matched with respect to race and age.

B. **Technical Objective 2** - To characterize workplace exposures using occupational histories (for duration of JF exposure), personal IH exposure monitoring, and breath analysis as a measure of internal dose.

C. **Technical Objective 3** - To determine if hormonal patterns differ significantly between the JF exposed and unexposed groups; to determine if there are effect differences between racial groups by collecting and analyzing daily urine and saliva samples.

D. **Technical Objective 4** - To determine if prevalences of menstrual disorders differ significantly between the JF-exposed and unexposed groups; to determine if there are effect differences between racial groups by collecting three months of menstrual cycle diary information.

Year 01 Annual Report:

Page two of the DoD's "Annual Report Review" dated Nov. 1997 delineated Year 01 "Statement of Work" (SOW) tasks #12-18 and #20 as "not addressed". Please note that, while the SOW referenced in the review was approved by the Grants Officer on June 30, 1997, the request for funds to pay for the indirect costs associated with shifting our travel to Year 01 was denied ten months into Year 01. Therefore our travel plans reverted to those outlined in the original SOW and our first "Annual Report" addressed the original SOW. Subsequent to the first report, we have addressed the revised tasks for Year 01 as follows:

Tasks 12 & 13: Collection of daily urine and saliva samples was piloted by five University of Cincinnati volunteers during 1997. Volunteers then provided feedback about the process and made suggestions for improvement. This information was used to develop the final protocol and instructions for urine and saliva sample collection and for development of the final version of the diary (sample collection items). The final version of the diary was submitted Year 01. Final instructions for urine and saliva collection (Appendix I) and the diary instrument (Appendix II) are attached for your reference.

Task 14: Industrial hygiene (IH) area and personal sampling was not initiated during Year 01 of the study at the first AFB, but rather during Year 02 at AFBs five and six. These samples were discovered to be invalid due to technical problems described later in the "Results and Discussion of SOW Activities" section of this report. A subgroup of IH samples from AFBs five and six were recollected during recent revisits to those AFBs. Subsequently, a subset of IH samples obtained from women at AFBs five through ten have been obtained, but not analyzed. These results will be available in the Year 03 report.

Tasks 15-18, 20: Implementation of these tasks is described in the Year 02 "Results and Discussion of SOW Activities" section of this report.

OVERVIEW OF METHODS AND PROCEDURES:

Air Force Base & Subject Recruitment (Year 01 SOW Item # 16 & 17):

Recruitment of Air Force bases (AFBs) was initiated during Year One with requests for Base Commander permission to visit *four* AFBs as planned in the proposal. Our original criteria for base selection involved choosing AFBs with the highest number of African American women in potentially exposed jobs as defined by Air Force Service codes (AFSCs) and the Occupational Series Codes (OS). Recruitment of selected AFBs involved preliminary identification of a contact-person within each base's Bioenvironmental Engineering group and mailing letters requesting study approval to each of the Base Commanders. Recruiting and scheduling bases involved follow-up activities, such as confirming permission, scheduling base visits around exercises and

deployments, identifying office space, arranging briefings and accessing phone recruitment lists. These activities were coordinated through contacts at each base.

Demographic data were obtained from the AF Personnel Center that listed the number of women in job codes associated with fuel exposure as described in the DoD-funded feasibility study by race, age and base (Puhala et. al, 1997). A second tier of demographic and recent work history data were the recruitment lists that were later obtained from Bioenvironmental Engineering contacts at each approved base after the Commander had given his approval. The bases' recruitment lists, always yielded a smaller number of exposed women than the AF demographic data had indicated. Once we were on-site, it became apparent there were even fewer women who were *currently* exposed than were projected from available preliminary demographic information. Consequently, recruitment was much more difficult and challenging than could have been anticipated.

In order to compensate for the reduced number of exposed women at each base, we recruited additional AFBs. Unfortunately, one key base among the sites having the largest number of women declined to participate, but all other bases contacted granted approval. **The SOW allowed for the recruitment of participants from a total of four bases during years 01 and 02. We have, at this time, recruited women from ten Air Force bases.** These bases included Davis-Mothan, Hill, Langley, Luke, Moody, Nellis, Seymour-Johnson, Shaw, Pope and Warner-Robins AFBs. While the primary criteria for selection of the additional bases was jet fuel exposure and race, a secondary consideration in scheduling was the proximity of bases to each other in order to reduce travel-associated costs that were not budgeted for in the grant.

Individual women were contacted both immediately before and during each base visit by telephone and in-person in order to ascertain their interest in and possible eligibility for study participation. The study requirements and the voluntary nature of participation were stressed. Women who indicated a desire to participate were scheduled for appointments. When they arrived for their appointments, a thorough review of study participation issues and eligibility criteria was provided and informed consent was obtained. During the personal interview, administrative and questionnaire forms were completed, written procedures for the home collection of urine and saliva samples were explained, daily diaries were reviewed, a work week breath sample for analysis was obtained and verbal and written instructions for collection of a Monday morning breath sample provided. Height and weight also were measured. Appointments were scheduled to allow 80 minutes for these activities

Internal Dose Exposure Measures (SOW Item #15 – Year 01 & # 2 & #6 –Year 02):

Breath samples were obtained twice (See Appendix 3 for protocal). The first breath sample, collected to assess fuel analyte levels in the vascular organ compartment, was provided by the participant during the initial interview on a weekday. A second

sample was collected to assess analyte levels in the fat compartment; these samples were collected in the a.m. when participants arose at home on Monday morning.

The breath samples were processed in the field by collecting one (1) liter of expired breath in a Tedlar bag which was subsequently introduced onto a Carbotrap 300 tube packed with four types of adsorbent materials which have varying degrees of affinity for the targeted analytes. An in-line filter composed of a desiccant (calcium chloride) is used to remove moisture from the expired breath while it is being introduced onto the sampling media. The tubes are immediately capped and sealed with teflon ferrules and refrigerated until overnight delivery. When received at the lab, the sampling tubes are immediately placed in the refrigerator until analysis. Analysis of the collection media is accomplished by thermally desorbing the stainless steel tubes and transporting the volatilized analytes into the gas chromatograph via the heated transfer line. The reusable sampling tubes are cleaned twice by heating them to their maximum allowable temperature while UHP nitrogen or helium is passed through the tubes at 40 mls. per minute.

Problems Encountered & Revisions in the Analytical Protocol for Breath Analysis:

A number of problems were encountered during Year 02 with the system for thermal desorption of exhaled breath analysis which were not apparent during Year 01 pilot testing. Breath samples from 75 women collected at six AF bases (i.e., Davis-Mothan, Nellis, Seymour-Johnson, Warner-Robins, Hill and Luke) were already analyzed at the time these problems were detected. These samples were rendered invalid. In order to obtain valid samples, two of the AF bases with the largest number of participants, Warner-Robins and Seymour-Johnson AFBs, were revisited (in tandem with visits to new AF bases). Breath samples from 22 women were recollected. In addition, revisits to Davis-Mothan and Luke AFBs have been scheduled in late October, 1998, with the goals of recollecting breath samples and recruiting new subjects. We hired a consultant (not budgeted for in the study) to conduct quality control and eliminate future laboratory error during the analysis of breath samples.

Additional DoD funding to permit further travel, subject recruitment and sample analysis were sought, but was denied. The budget for this study has been extremely tight because of the need to hire additional technical assistance for the breath analysis and equipment for the breath analysis and the need to visit additional bases.

Original Analytical Protocol:

The original system consisted of a Tekmar LSC 3000 Purge and Trap interfaced with a Photovac 10S Plus Portable Gas Chromatograph. The desorbed tubes were then cleaned with a Dynatech Model 60 six position thermal conditioning unit. The Photovac GC utilizes a UV lamp for the detection of ionizable compounds. The detector amplifier

employs a gain amplifier which displays an offset value when the detector is saturated. By closely monitoring the offset level in the detector status box, it was determined that the detector was not able to perform the analysis as previously assumed. The Photovac GC also employed a 10 meter, .530 mm ID column for the resolution of the BTEX (benzene, toluene, ethylbenzene, and xylenes) components; this system also proved to be inadequate for the separation of the individual components.

Approximately 5 weeks were dedicated to making the Photovac unit operational when it was decided to use a HP 5890 Series II Gas Chromatograph to investigate the possibility of achieving the low detection levels needed with a flame ionization detector (FID). The FID would give the extended linear range that was needed with some samples that were known to contain high levels of organic constituents. A 30 meter, .45mm ID, DB-VRX column was used to separate the thermally desorbed components in the sampling media; a thick wall coating (2.54 um) was used to optimize chromatographic banding thereby concentrating analytes and lowering detection limits. Many modifications of the carrier gas system were needed before the heated transfer line of the purge and trap unit could be directly interfaced with the new DB-VRX column. This required the use of specialized tools and fittings which had to be shipped in from various locations; finally, a zero dead volume (ZDV) union was fitted to the 1/16 inch nickel tubing of the heated transfer line and the .45 mm glass tubing of the column. The ZDV was a critical component in the sampling path that had to be perfectly installed. Every time the ZDV was opened and readjusted, the column had to be purged overnight, thereby losing valuable method development time.

The Purge and Trap unit was then determined to be inoperable; when purging the system with inert helium gas, the analytes were stripped from the sampling media and lost. Purging the lines was required to prevent reactive oxygen from entering the heated column where it would degrade the column coating used for the separation of the analytes. The needle valve in the trap pressure control assembly was not functioning correctly and the pressure gauge had a line blockage; this was a very difficult problem to identify and locate and required multiple trips to the Tekmar repair facility.

Revised Analytical Protocol:

Because of the above problems, samples from women with and without fuel exposure were lost. After months of setbacks, the system was finally operable and optimization of the sample path could begin. The elimination of cold spots in the desorb path was accomplished by shortening the tubing and raising the valve oven temperature by 50 C°. The desorb time was extended to 4 minutes at 230 C° and a .5 minute dry purge of the path was determined to be adequate with a back pressure on the trap of 5 psi. The thermocouple on the 2 and 5/8 inch trap furnace went out and the furnace had to be replaced with a custom built replacement, not a Tekmar stock item. Peak resolution was further improved by optimizing the fuel gas (hydrogen) to carrier gas (helium) ratio.

Approximately 4 to 5 months were required to develop this method due to the inability of the Photovac GC to resolve or detect the compounds of interest. Development was further hindered by the incapacity of the purge and trap unit to hold a back-pressure on the trap thereby allowing the analytes to be stripped from the sampling media during the purge cycle.

Final Analytical Protocol:

Analysis according to the revised protocol is accomplished by thermal desorption of the SS tubes with a Tekmar 3000 Purge and Trap. The instrument is modified by placing the sampling tubes in line where the trap is normally located. A 2.5 inch furnace is used to heat the tubes to 225 degrees Celsius during the preheat and they are desorbed for four minutes at 230 degrees Celsius. Removal of oxygen from the tubing is accomplished by a 30 second dry purge while maintaining the back pressure in the trap at 5 psi. The heated analytes are swept off the sampling media by UHP helium at a flow rate of 13 mls per minute and into the nickel tubing of the transfer line which is maintained at 150 degrees Celsius. The transfer line is directly connected to the column by a zero dead volume union. The column inlet is heated to 275 degrees Celsius to eliminate and cold spots in the ZDV union. The analysis is performed by using a Hewlett-Packard Model 5890 Series 2 Gas Chromatograph connected to a Hewlett-Packard Model 3396 Integrator. A DB-VRX (30 meter, .45mm ID, 2.54 micron film thickness) column is used to separate and focus the analytes. An FID detector is used to quantify the components as they exit the column. FID sensitivity was accomplished by optimizing the hydrogen fuel /carrier gas composition. The GC operating parameters are:

Oven:	45°, hold 3 minutes to 80° at 3.5° per minute, hold 0 minutes, to 185° at 40° per minute, hold 1 minute
Inlet:	275°
Detector:	300°
Carrier flow:	Helium @ 13 mls per minute
Detector:	FID, make up flow @ 9 mls per minute

RESULTS AND DISCUSSION OF SOW ACTIVITIES (Year 02):

This section of the report details how each activity was addressed, and the results of each activity are supplied. There were eight SOW activities for Year 02. We will begin by providing background on study participation issues relevant to data collection and laboratory analysis at the *ten* (not four) AFBs. **Subject recruitment occurred prior to shipping samples (SOW #1,3 & 8), therefore the SOW activities are presented in *sequential order* as the tasks were implemented, rather than numerical order.**

Year 02 SOW Items #2 and #6:

Year 02 items two and six were as follows:

2. **Perform items 15-19 (see SOW Year 01) at Base 3 on approximately *50* women (months 15-18).**

6. **Perform items 15-19 (see SOW Year 01) at Base 4 on approximately *50* women (months 21-24).**

Items 15-19 in the SOW refer primarily to subject participation activities that were enumerated in Year 01 of that document. These activities included conducting breath analysis sampling (Item #15), administering occupational and menstrual history questionnaires (Item #16), implementing menstrual diaries and collecting daily urine and saliva samples (Item #17), shipping samples (Item #18) and preparing the annual report (Item #19).

We have thus far contacted approximately 679 women. Of those 679 women, 165 (24.3%) were eligible and participated. Of the remaining potential subjects, 358 (52.7%) did not meet our eligibility requirements, 131 refused (19.3%), and 25 (3.7%) were no shows for various reasons on the day of the interview. In addition to the 679 females contacted, and additional 264 women were unavailable when phone contact was attempted due to their being absent (i.e., TDY, deployed, on leave, on vacation, etc.) or no longer at the AFBs. Table 3 below summarizes the outcomes of recruitment attempts for all 943 women that we sought in-person and/or by phone.

Table 3

Recruitment Status of Potential Subjects by Participation Outcome Category

Recruitment Outcome:	**Number**
Eligible, participated:	165
Eligible, declined participation:	131
Ineligible:	358
Scheduled, but no shows:	25
Unavailable (absent or gone):	264
Totals	**943**

Table 4 describes the participating bases by exposure status of each subject. As can be seen in Table 4 there are thus far 61 exposed and 104 unexposed subjects. There are 64 minority and 101 non-minority female subjects.

Table 4

PRELIMINARY PARTICIPATION ESTIMATES BY EXPOSURE STATUS & BASE

BASE	LOCATION	Exposed	Non-exposed
Davis	AZ	9	3
Hill	UT	5	16
Luke	AZ	9	10
Langley	VA	5	12
Moody	GA	4	10
Nellis	NV	5	3
Pope	NC	3	2
Robins	GA	12	22
Seymour Johnson	NC	5	17
Shaw	SC	4	9
Total (10 Bases)		**61**	**104**

During the trips scheduled for late October, 1998, we will continue to conduct recruitment, obtain breath samples, administer occupational and menstrual history questionnaires, and distribute study materials to participants (i.e., urine and saliva collection kits and daily diaries. We anticipate that collection of urine and saliva samples will continue until January of 1999. However, due to no remaining budgeted travel funds we will be unable to recruit any additional subjects.

Analysis of Breath Samples:

Results of the breath samples analyzed to-date using the revised laboratory analytical protocol are preliminary. The breath data indicates concentrations of toluene and o-xylene ranging from 10 to 80 ppb and m/p-xylene is found to range over 100 ppb. Ethylbenzene concentrations are relatively lower. Benzene, if present, is obscured by an early eluter in extremely high concentration; this early eluter is assumed to be heptane or trimethylbenzene. Rarely, benzene is detected in relatively low concentrations. There is a very large peak later in the spectrum that is assumed to be nonane or decane. This peak serves as a very good internal standard that is indicative of shifting retention times. Further studies are currently in progress to determine the exact nature of these unknown

compounds. Optimization of chromatographic data are currently performed on an electronic integrator. Our Department has agreed to purchase a data acquisition package for additional breath analyses in this study at a cost of $5,000.

SOW Items #1, #3 & #8:

1. **Ship samples to NIOSH; perform laboratory analysis of IH and biological samples collected at Base 2; inventory and organize urine samples; store/conduct urinary LH & FSH fluoroimmunoassays; store/conduct urinary $E_1$3G and Pd3G fluoroimmunoassays; store/conduct creatinine assays (months 13-16)**

3. **Ship samples to NIOSH; perform laboratory analysis of IH and biological samples collected at Base 3; inventory and organize urine samples; conduct urinary LH & FSH fluoroimmunoassays; conduct urinary $E_1$3G and Pd3G fluoroimmunoassays; conduct creatinine assays (months *16*-19).**

8. **Ship samples to NIOSH; perform laboratory analysis of IH and biological samples collected at Base 4; inventory and organize urine samples; conduct urinary LH & FSH fluoroimmunoassays; conduct urinary $E_1$3G and Pd3G fluoroimmunoassays; conduct creatinine assays (months 23-25)**

A subgroup of women have supplied samples at this time. As described in Table 5, valid breath workweek breath samples (internal dose) are available from 80 women; biological samples for hormone analysis have been received from 94 women (32 additional women are still collecting samples). The hormone samples have been received and inventoried at NIOSH by Dr. James Kesner. Due to the extended sample collection timeline necessitated by the inclusion of six additional bases, the laboratory analysis of the samples will take place during Year 03 beginning in February. In order to assure the quality of sample analyses, it is necessary that all the urine and saliva samples be analyzed using reagents from the same lot.

Table 5

Summary of The Number of Participants Supplying Study Materials To-date, Including Questionnaires, Urine and Breath Samples*

Study Materials:	Exposed	Non-Exposed	Total
Questionnaires:	61	104	165
Total Hormone (Received and Pending):	46	80	126
Total Breath:	29	51	80

*** Includes only samples analyzed using the revised protocol**

There was a subgroup of the 165 participants who were unable to complete all aspects of the study. Sixteen women ended collection of urine, saliva and diary information before the second (Monday) breath sample. Additionally, six women ceased sample and diary collection after continuing the study beyond the initial phase. The most frequent reasons subjects cited for quitting were that they were "too busy" to conduct the daily tasks through two menstrual periods. Other subjects dropped-out because they were TDY or deployed to the Persian Gulf (poor refrigeration access), supervisor objection or samples were discarded by others (and not repeated by the subjects). Three subjects had to be excluded because they became pregnant, and one had to be excluded because they decided to start taking oral contraceptives after initiation of the study.

In order to facilitate the collection of urine and saliva samples and their return to NIOSH, participants were given a toll-free number and asked to call Dr. Kesner with any questions and to also alert him when samples were obtained thru to menses. The process for returning samples was also facilitated by the provision of a mailing kit, complete with an air bill and written instructions for FED-X overnight return mailing. Despite these efforts, urine/saliva samples collected by eight subjects were reportedly "lost in the mail" and could not be recovered despite subsequent tracking efforts. Seven women supplied diaries for a portion of the time they collected urine and saliva; diary information was concurrent with at least one menstrual period in most instances.

SOW Item #4 – Year 02:

4. Abstract military personnel and occupational history data for validity subanalysis (month 16).

Abstraction of job code information, i.e., Air Force Service Codes (AFSCs) and Occupational Series (OSs), from Air Force database lists has been completed. In order to collect these data, job codes linked to exposure were supplied to Air Force database managers. Women at each base with the identified job codes plus women in additional jobs designated as possibly exposed by local Bioenvironmental Engineering personnel were listed as potential study recruits. Lists of women without fuel exposure were also identified by AF database managers and Bioenvironmental Engineering personnel. Dates associated with the AF job code lists were provided. Participant-reported job history information, i.e., AFSCs/OSs and duration of employment in current jobs, was also obtained. Both participant-reported and military job code data and duration of employment information have been entered into a University of Cincinnati database in preparation for the subanalysis described below.

SOW Item #5 – Year 02:

5. Conduct validity subanalysis: questionnaire *vs.* military records and prepare validity subanalysis report (months 18-21).

A subset of AF bases supplied military database records of AFSCs/OSs held by subjects during the 12 months preceding implementation of the study at the respective sites. The availability of this group permitted a comparison of subject-reported and military record data. The military records of AFSCs/OSs were considered to be the "gold standard" against which the AFSCs/OSs reported by participants during the corresponding time frame were compared. The results are described in Table 6.

Table 6

Number and Percent Agreement between Subject-reported & Air Force Database-recorded Job Codes (AFSCs/OSs)* by Time Interval between Record and Interview

Agreement Category:	AFSC/OS sans Skill Level
Agree on Job Code:	Number (%)
Interval <1 to 6 mo.	16 (73%)
7 to 12 mo.	8 (100%)
Disagree on Job Code:	
Interval <1 to 6 mo.	6 (27%)
7 to 12 mo.	0 (0%)

* subset includes participants for whom both military record and subject-reported data were available

Skill levels are encoded as one of the digits in the AFSC. Changes in skill levels within the same job (AFSC) may or may not reflect an accompanying alteration in exposure levels. Some of the military women reported their AFSCs without specifying the skill levels. In other cases, the recorded and reported AFSCs disagreed because the subjects did not characterize skill levels changes, which they may consider to be promotions or demotions, as job changes. Many of the women reported higher skill levels than those that appeared on the dated AFSC lists; this probably reflects true changes in skill levels. For this reason, agreement is greatly improved when skill level is not compared (see Table 6). The implication is, when obtaining historical job information, AF participants must be specifically asked about changes in both their AFSC and skill level.

SOW Item #7 – Year 02:

7. Prepare year 02 summary report (months 22-24).

Year two report is completed with this document.

Conclusions:

Our goal of obtaining exposure and hormone data from a racially balanced sample of 100 exposed and 100 unexposed women has been partially attained.

Efforts to remedy the situation have included extensive unbudgeted travel and revision of our breath analysis protocol and a request for additional funds from DoD that was denied. Three additional AFBs have been targeted for recruitment, if funding becomes available. An investment of $25,000 would permit us to continue the recruitment phase of this important study and fully meet our scientific objectives.

List of Paid Personnel:

Grace K. Lemasters, PhD
James Lockey, MD, MS, Co-investigator
Susan Simpson, MS, Project Coordinator
Donna Olsen, PhD, Research Associate
Dennis Meyer, MS, Analysis Contractor
Graduate Student Helpers (varies)
Three Interview Contractors

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APPENDIX I:

U.S.A.F. JET FUEL HEALTH PROJECT PROTOCOL
DAILY SALIVA COLLECTION INSTRUCTIONS

SALIVA COLLECTING PLAN:
For this study, you will start collecting your saliva tomorrow morning. You will continue collecting your early morning saliva samples every day through your next full menstrual cycle and for 2-3 days after your second menstrual period has ended. This is the same schedule as for collecting urine samples, as shown on the time line on the last page.

You should **use the gum** to collect your saliva **BEFORE** you eat, drink, or brush your teeth. If you must collect your saliva sample after eating, drinking, or brushing your teeth, wait at least 30 minutes after these activities and then collect the saliva.

Call Dr. James Kesner, the Study Laboratory Director (800-870-0201), if you ever have any questions. Also call him when you have finished collecting all your saliva samples.

THE SUPPLIES that you will receive today for daily saliva collection are:
- 1 cardboard box containing 84 labeled & capped vials & 1 plastic pearl
- 6 packs (90 sticks) of CareFree Sugarless gum

WHEN YOU RECEIVE YOUR SUPPLIES:
- The saliva sample vials are arranged in the box in rows by week; the vials in the top row are for this week. Vials for all the Sunday samples are in the left column, and so on. The vials for the last 2 weeks are arranged side-ways along the right side of the box. (Please see the diagram on last page).

- Look at the label on the very first vial in the top-left corner. The label contains:
  - your Study ID number,
  - the Sample # (this vial is for Sample #1),
  - the day of the week (this vial is for Sunday),
  - space to write the date(___/___/9__),
  - a jet icon and an arrow.

- Start with the top row of vials on the left corner and remove the vials up to and including the vial for today, i.e., if today is Thursday, remove the first 5 vials for Sunday through Thursday. These vials you remove are extras. You may store them in case you lose or need a spare vial.

- When you get home, remove tomorrow's vial and put it in the bathroom with the urine vial and collection cup, where they will remind you to collect your samples early tomorrow morning.

COLLECTING SALIVA:

1. Always store the sample box containing samples in the **freezer**.

2. Before you go to bed, take the next morning's vial out of the sample box in the freezer. You can transfer the pearl to the next vial cap to mark your place. Place the vial in the bathroom, ready for saliva collection when you awake in the morning. **Make sure the vial label matches tomorrow's day of the week.**

3. When you get up for the day, before you eat, drink, brush your teeth, or apply lipstick, **rinse your mouth out well with water.**

4. **Wait about 5 minutes.** While you are waiting, start chewing a stick of the Care-Free Sugarless gum. **Please use the gum, even if you don't need to.** Get the saliva vial with today's day of the week on the label. Take the lid off of the tube.

5. **After about 5 minutes has passed, and while still chewing the gum, begin to collect saliva by spitting into the tube.** You will need to do this for about 2-5 minutes to collect saliva up to the arrow on the label, not counting bubbles. This is about 2 milliliter (less than 1 teaspoon) of saliva. Looking into a mirror as you collect the first couple samples may make collection easier. Holding the vial with a tissue may make collection cleaner.

6. After collecting the sample, screw the cap **tightly** onto the tube.

7. **Write the date on the sample vial's label.** Use the water-proof study pen.

8. **Write in your diary:**
   - the sample # from the vial's label
   - the **military time** the sample was collected

9. Place the filled saliva vial in its slot in the sample box in the freezer and remove the next vial from the sample box. Check the label for tomorrow's day of the week and place the vial in the bathroom for your next morning sample.

10. Repeat this procedure for each day that you collect saliva.

11. Telephone Dr. Kesner, the Lab Director (800-870-0201), 1 week after your entry interview. This will allow you to discuss your study progress. Try to call between 8 a.m. & 5 p.m. eastern time. You may also leave a phone message.

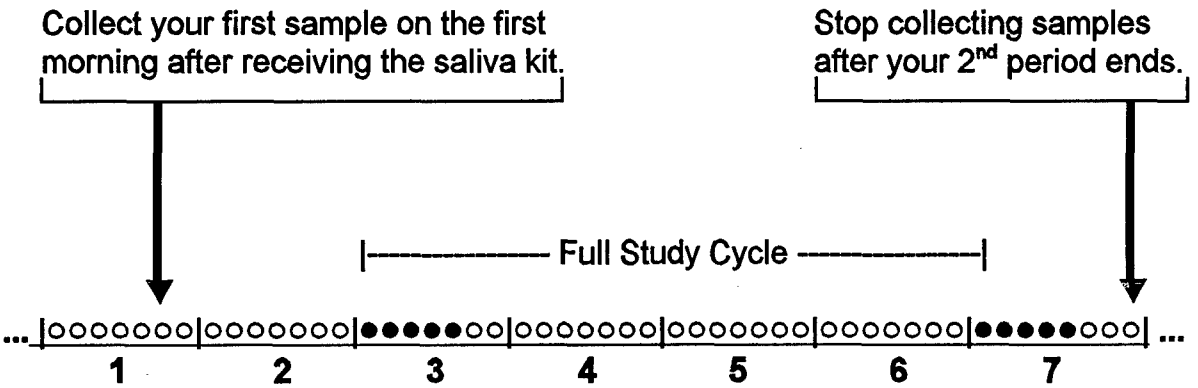
Immediately telephone Dr. Kesner (800-870-0201) if you have any questions.

SPECIAL NOTES:

- **Collect your saliva every morning.**
- **Keep all your samples frozen at all times.**
- **If you travel**, follow the same instructions as for urine.
- **Collect the saliva sample first thing in the morning**, when you collect your urine sample. If you must collect your saliva sample after eating, drinking, or brushing your teeth, wait at least 30 minutes after these activities, rinse your mouth, and then collect the saliva. Make a note in your diary describing these activities. Remember: **A late sample is better than no sample!**
- **If you do not collect saliva on a day**, leave that vial empty, make a note about this in your diary, and collect your sample for the next day in the next vial, as usual.
- **If you accidentally fill the wrong vial** or for some other reason must change the label, note the change on the plastic area of the test tube with your water-proof study marker. Make a note about this change in your diary.
- Record **military times.**
- **Some replacement materials** (pens, gum, etc.) may be available from your Base BEE Point of Contact. If you get replacement supplies, please note this in your diary or on the 800-870-0201 number.
- **Returning Your Saliva Samples:** Call Dr. Kesner, the Lab Director (800-870-0201), as soon as you are sure you are having your second menstrual period. You and he will determine if you are finished collecting your study samples and coordinate shipping your samples back to the Study Lab, using the written instructions you have already received.

Be sure to immediately contact Dr. Kesner at 800-870-0201 if you have any questions or problems.

EXAMPLE of COLLECTING DAILY SALIVA SAMPLES THROUGH A FULL MENSTRUAL CYCLE



●●●●● = period

Arrangement of Vials in the Saliva Box

Sun #1	Mon #2	Tue #3	Wed #4	Thu #5	Fri #6	Sat #7			
Sun #8	Mon #9	Tue #10	Wed #11	Thu #12	Fri #13	Sat #14			
Sun #15	Mon #16	Tue #17	Wed #18	Thu #19	Fri #20	Sat #21			
Sun #22	Mon #23	Tue #24	Wed #25	Thu #26	Fri #27	Sat #28		Sat #77	Sat #84
Sun #29	Mon #30	Tue #31	Wed #32	Thu #33	Fri #34	Sat #35		Fri #76	Fri #83
Sun #36	Mon #37	Tue #38	Wed #39	Thu #40	Fri #41	Sat #42		Thu #75	Thu #82
Sun #43	Mon #44	Tue #45	Wed #46	Thu #47	Fri #48	Sat #49		Wed #74	Wed #81
Sun #50	Mon #51	Tue #52	Wed #53	Thu #54	Fri #55	Sat #56		Tue #73	Tue #80
Sun #57	Mon #58	Tue #59	Wed #60	Thu #61	Fri #62	Sat #63		Mon #72	Mon #79
Sun #64	Mon #65	Tue #66	Wed #67	Thu #68	Fri #69	Sat #70		Sun #71	Sun #78

U.S.A.F. JET FUEL HEALTH PROJECT PROTOCOL
DAILY URINE COLLECTION INSTRUCTIONS

URINE COLLECTING PLAN:

For this study, you will start collecting your urine tomorrow morning. You will continue collecting your first morning urine every day through your next full menstrual cycle and for 2-3 days after your second menstrual period has ended. Please see the time-line on the last page for clarification.

Call Dr. James Kesner, the Study Laboratory Director (800-870-0201), if you ever have any questions. Also call him when you have finished collecting all your urine samples.

THE SUPPLIES that you will receive today for daily urine collection are:

- 2 cardboard boxes, each containing 42 labeled & capped vials
- 1 metal ring marker
- 2 plastic cup with pouring spout
- 1 water-proof marking pen
- 1 Styrofoam chest
- 2 freezer ice packs
- 1 instructions for shipping your samples to the Study Lab by Federal Express
- 1 Federal Express air bill & envelope
- 1 roll sealing tape

WHEN YOU RECEIVE YOUR SUPPLIES:

- Notice that the sample vials are arranged in the box in rows, week by week; the vials in the top row are for this week. Vials for all the Sunday samples are in the left column, and so on. (Please see the diagram on last page).

- Look at the label on the very first vial in the top-left corner. The label contains:
  - your Study ID number,
  - the Sample # (this vial is for Sample #1),
  - the day of the week (this vial is for Sunday),
  - space to write the date(__/__/9__),
  - a jet icon and an arrow.

- Start with the top row of vials on the left corner and remove the vials up to and including the vial for today, i.e., if today is Thursday, remove the first 5 vials for Sunday through Thursday. These vials you remove are extras. You may store them in case you lose or need a spare vial.

- When you get home, remove tomorrow's vial and put it with the plastic urine collection cup and saliva vial in the bathroom where they will remind you to collect your samples tomorrow morning.

COLLECTING URINE:

1. Always store the sample boxes containing samples in the **freezer**.

2. Each night before you go to bed, make sure you have taken the next morning's vial out of the sample box in the freezer. You can transfer the metal ring to the next vial cap to mark your place. Place the vial and plastic collection cup in the bathroom, ready for urine collection when you awake in the morning. **Make sure the label on the vial matches tomorrow's day of the week.**

3. When you get up for the day, collect some of this **first morning urination** in the plastic cup.

4. Carefully pour urine from the cup into the vial. **Fill the vial as close to the arrow on the label as possible.** Screw the lid **tightly** on the sample vial.

5. Turn the tube **upside-down three times** to mix the urine with preservative.

6. **Write the date on the sample vial's label.** Use the water-proof study pen.

7. **Write in your diary:**
   - the vial # from the sample label
   - the **military time** the sample was collected

8. Discard the urine remaining in the plastic collection cup and rinse the cup with warm water. Do <u>NOT</u> wash with soap or detergent. Place the cup upside down on clean tissue to drain for tomorrow's sample.

9. Place the filled urine vial in its slot in the sample box in the freezer and remove the next vial for tomorrow. Check the label for tomorrow's day of the week and place the vial in the bathroom for your next morning sample.

10. Repeat this procedure for each day that you collect urine.

11. Telephone the Dr. James Kesner, the Lab Director (800-870-0201), 1 week after your entry interview. This will allow you to discuss your study progress. Try to call between 8 a.m. & 5 p.m. eastern time. You may also leave a phone message.

Immediately telephone Dr. Kesner (800-870-0201) if you have any questions.

SPECIAL NOTES:

- **Collect your urine every morning**, even during your period or when you have had sexual intercourse.

- **Keep all your samples frozen at all times**. If this is not possible, keep them refrigerated or as cool as possible and then freeze them as soon as possible. Make notes every time that your samples are not immediately frozen.

- **Collecting & freezing your daily samples during travel:**
  - Take your **1)** sample vials for the travel days, **2)** the plastic collection cup, **3)** the water-proof pen, and **4)** one or more Aladdin thermoses (available upon request). These thermoses will each hold urine & saliva vials for 3 days. The thermos cap contains coolant material, so keep the thermos and samples in a freezer or refrigerator as much as possible during your travel. If possible, unscrew the thermos lid while in the freezer so the lid and samples will freeze. When you return home, place the sample vials in the freezer boxes and make notes about these activities in your diary.

  - If you are going to be traveling for a long period, use your study Styrofoam chest and ice packs to replace the Aladdin thermos. Otherwise, follow the instructions above. Call Dr. Kesner if you have questions.

- **If you miss your first morning urine**, collect the sample as early in the day as possible. Make a note about this in your diary. Remember: **A late sample is better than no sample!**

- **If you do not collect urine on a day**, leave that vial empty, make a note in your diary, and collect your sample for the next day in the next vial, as usual.

- **If you accidentally fill the wrong vial** or for some other reason must change the label, note the change on the plastic area of the test tube with your water-proof study marker. Make a note about this change in your diary.

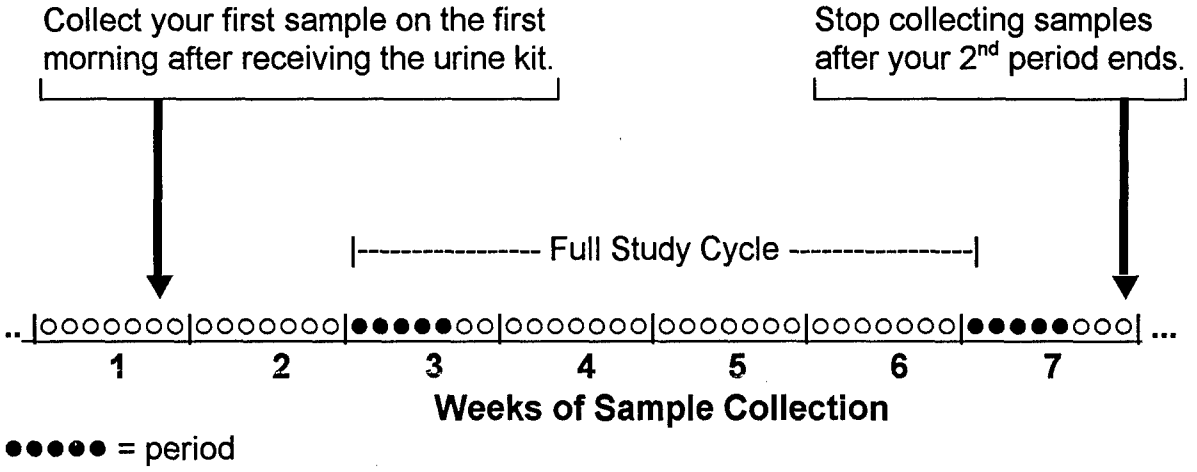
- **Record military times.**

- **Some replacement materials** (pens, beakers, etc.) may be available from your Base BEE Point of Contact. If you get replacement supplies, please note this in your diary or on the 800-870-0201 number.

- **Returning Your Urine Samples:** Call Dr. James Kesner, the Lab Director (800-870-0201), as soon as you are sure you are having your second menstrual period. You and he will determine if you are finished collecting your study samples and coordinate shipping your samples back to the Study Lab, using the written instructions you have already received.

Contact Dr. Kesner (800-870-0201) If You Have Any Questions or Problems.

EXAMPLE of COLLECTING DAILY URINE SAMPLES THROUGH A FULL MENSTRUAL CYCLE



Vial Arrangement in Urine Box #1

Sun #1	Mon #2	Tue #3	Wed #4	Thu #5	Fri #6	Sat #7
Sun #8	Mon #9	Tue #10	Wed #11	Thu #12	Fri #13	Sat #14
Sun #15	Mon #16	Tue #17	Wed #18	Thu #19	Fri #20	Sat #21
Sun #22	Mon #23	Tue #24	Wed #25	Thu #26	Fri #27	Sat #28
Sun #29	Mon #30	Tue #31	Wed #32	Thu #33	Fri #34	Sat #35
Sun #36	Mon #37	Tue #38	Wed #39	Thu #40	Fri #41	Sat #42

Vial Arrangement in Urine Box #2

Sun #43	Mon #44	Tue #45	Wed #46	Thu #47	Fri #48	Sat #49
Sun #50	Mon #51	Tue #52	Wed #53	Thu #54	Fri #55	Sat #56
Sun #57	Mon #58	Tue #59	Wed #60	Thu #61	Fri #62	Sat #63
Sun #64	Mon #65	Tue #66	Wed #67	Thu #68	Fri #69	Sat #70
Sun #71	Mon #72	Tue #73	Wed #74	Thu #75	Fri #76	Sat #77
Sun #78	Mon #79	Tue #80	Wed #81	Thu #82	Fri #83	Sat #84

U.S.A.F. JET FUEL HEALTH PROJECT PROTOCOL

ID. _____

INSTRUCTIONS FOR MAILING THE SAMPLES TO THE STUDY LABORATORY BY FEDERAL EXPRESS

When you are sure you are having your second menstrual period, call Dr. James Kesner, the Study Laboratory Director, at **800-870-0201.** You and he will determine if you are finished collecting your study samples and coordinate shipping your samples back to the Study Lab using the following instructions.

1. Prior to shipment, always keep your samples stored frozen.

2. When you and Dr. Kesner decide that you have completed collecting samples, identify the next Monday, Tuesday, or Wednesday that is convenient for you to send them by Federal Express.
   DO NOT ship samples on a Thursday, Friday, Saturday, or Sunday.

3. Place all the "ice packs" in your freezer, at least over night, in preparation for shipment. If you have an empty urine sample box that has not been frozen, put that in the freezer to get it cold, too.

4. At least one day before the shipment, phone Federal Express (**800-463-3339, option** ✳) and schedule them to come to your home or work for free pick-up. **Do not deliver your package. We have had many samples lost when participants took their package to "Federal Express."**

5. Be prepared to provide or discuss the following information:
   - the time for pick-up or delivery,
   - your home or work address,
   - the package weighs 7 pounds,
   - the shipment is government priority overnight on account number 0452-1271-8, and
   - the air bill number: _____.

6. Prepare the package as described below.

7. Make sure that you or someone you trust hands your sample package directly to the Federal Express courier to check the air bill. Do not leave the box for Federal Express to pick-up or with someone you don't completely trust. **Samples have been lost or destroyed these ways.**

8. Make sure the FedEx courier gives you the "Sender's" copy of the air bill.

9. Call Dr. Kesner (800-870-0201) to confirm that the samples were picked up.

PACKAGE PREPARATION:

1. Remove the Styrofoam chest from the cardboard box. Place your 2 frozen urine sample boxes and the frozen saliva sample box in the Styrofoam chest. Arrange the frozen "ice packs" around the sample boxes. Fill all remaining space with wadded newspaper to keep everything firmly in place and insulated.

2. Place your diaries inside the Styrofoam box.

3. Tape the Styrofoam lid tightly shut with the sealing tape that we gave you. Place the Styrofoam box into the cardboard crate and tape it closed very securely.

4. Write your **name, address, telephone number, and today's date** on the air bill form in the highlighted spaces in the upper left-hand corner.

5. Remove the clear envelope's larger adhesive backing and stick the envelope to the top of the shipping crate. Insert the air bill into the envelope. **DO NOT** seal the envelope!

6. If you have any questions, please telephone **Dr. James Kesner at 800-870-0201.**

APPENDIX II

Female Reproductive Study
Daily Diary

In this diary, "TODAY" means 1700 (5 pm) YESTERDAY to 1700 (5 pm) TONIGHT local time

Date

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Mnth Day Year	Mnth Day Year	Mnth Day Year	Mnth Day Year	Mnth Day Year	Mnth Day Year	Mnth Day Year

Today's Urine Sample

1a) Time the sample was obtained (record military time)

1b) Hours since last urination (record # of hours; 2 hrs=02)

1c) Sample number on today's urine vial (record sample #)

Today's Saliva Sample

2a) Time the sample was obtained (record military time)

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ID: _____ Week: _____ Page # 1

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
2b) Sample number on today's saliva vial (record sample #)	0 0 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9	0 0 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9	0 0 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9	0 0 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9	0 0 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9	0 0 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9	0 0 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9

Today, did you have any problems with:

3a) Urine or saliva collection	Y N	Y N	Y N	Y N	Y N	Y N	Y N
3b) Sample storage or transport	Y N	Y N	Y N	Y N	Y N	Y N	Y N
3c) Explain if YES to 3a or 3b							
4) How many total hours did you sleep in the last 24 hrs. (hours between 1700 yesterday and 1700 today; 8 hours=08)	0 0 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9	0 0 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9	0 0 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9	0 0 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9	0 0 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9	0 0 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9	0 0 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9

5) Did you have a cold, flu, other infection or fever of 101 or more today?

5)	Y N	Y N	Y N	Y N	Y N	Y N	Y N
6) Were you usually ______ today?	Hot H Warm W Comfortable M Cold C Very Cold V	Hot H Warm W Comfortable M Cold C Very Cold V	Hot H Warm W Comfortable M Cold C Very Cold V	Hot H Warm W Comfortable M Cold C Very Cold V	Hot H Warm W Comfortable M Cold C Very Cold V	Hot H Warm W Comfortable M Cold C Very Cold V	Hot H Warm W Comfortable M Cold C Very Cold V

Today, did you have any of the symptoms listed below?

M = yes, menstrual/Premenstrual symptom X = yes, *NOT* a menstrual/Premenstrual symptom N = No;

7) Lower Abdominal Cramping	M X N	M X N	M X N	M X N	M X N	M X N	M X N
8) Aching Back or Thighs	M X N	M X N	M X N	M X N	M X N	M X N	M X N
9) Bloating and/or Painful Breasts	M X N	M X N	M X N	M X N	M X N	M X N	M X N
10) Headache	M X N	M X N	M X N	M X N	M X N	M X N	M X N
11) Nausea	M X N	M X N	M X N	M X N	M X N	M X N	M X N
12) Loss of Appetite	M X N	M X N	M X N	M X N	M X N	M X N	M X N
13) Diarrhea	M X N	M X N	M X N	M X N	M X N	M X N	M X N

If you recorded "M" on any of the above, answer #14-#16; otherwise go directly to #17

For staff use only ID: __________ Week: __________

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

14) Did you need to LIE DOWN due to any of the above menstrual/premenstrual symptoms today?

(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)

15) Did you MISS WORK due to any of the above menstrual/premenstrual symptoms today?

(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)

16) Did you take prescription or non-prescribed medication(s) for any of the above menstrual/premenstrual symptoms today?

(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)

17) Did you START taking any (OTHER) prescribed or non-prescribed medication(s) or supplements today?
If YES, please list the medication(s).

(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)

18) Did you have any MENSTRUAL BLEEDING or SPOTTING today? *(If NO go directly to # 22)*

(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)

19) How many TAMPONS and SANITARY NAPKINS did you use today? *(2 Sanitary Napkins = 02)*

20) What was the AMOUNT of BLOOD?

(0 0) (1 1) (2 2) (3 3) (4 4) (5 5) (6 6) (7 7) (8 8) (9 9)						
Spotting (1) Light (2) Moderate (3) Heavy (4)						

21) Did you have any LEAKAGE around your pad or tampon while you last SLEPT?

(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)

22) Did you SMOKE today? *(if NO go to #27)*

(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)	(Y) (N)

23-25) Please Record the Number of Cigarettes and Cigars Smoked Today

CF=Charcoal Filtered RF=Regular Filtered or Unfiltered CI=Cigars

CF	RF	CI	CF	RF	CI	CF	RF	CI	CF	RF	CI	CF	RF	CI	CF	RF	CI	CF	RF	CI
0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0														
1 1 1 1 1 1	1 1 1 1 1 1	1 1 1 1 1 1	1 1 1 1 1 1	1 1 1 1 1 1	1 1 1 1 1 1	1 1 1 1 1 1														
2 2 2 2 2 2	2 2 2 2 2 2	2 2 2 2 2 2	2 2 2 2 2 2	2 2 2 2 2 2	2 2 2 2 2 2	2 2 2 2 2 2														
3 3 3 3 3 3	3 3 3 3 3 3	3 3 3 3 3 3	3 3 3 3 3 3	3 3 3 3 3 3	3 3 3 3 3 3	3 3 3 3 3 3														
4 4 4 4 4 4	4 4 4 4 4 4	4 4 4 4 4 4	4 4 4 4 4 4	4 4 4 4 4 4	4 4 4 4 4 4	4 4 4 4 4 4														
5 5 5 5 5 5	5 5 5 5 5 5	5 5 5 5 5 5	5 5 5 5 5 5	5 5 5 5 5 5	5 5 5 5 5 5	5 5 5 5 5 5														
6 6 6 6 6 6	6 6 6 6 6 6	6 6 6 6 6 6	6 6 6 6 6 6	6 6 6 6 6 6	6 6 6 6 6 6	6 6 6 6 6 6														
7 7 7 7 7 7	7 7 7 7 7 7	7 7 7 7 7 7	7 7 7 7 7 7	7 7 7 7 7 7	7 7 7 7 7 7	7 7 7 7 7 7														
8 8 8 8 8 8	8 8 8 8 8 8	8 8 8 8 8 8	8 8 8 8 8 8	8 8 8 8 8 8	8 8 8 8 8 8	8 8 8 8 8 8														
9 9 9 9 9 9	9 9 9 9 9 9	9 9 9 9 9 9	9 9 9 9 9 9	9 9 9 9 9 9	9 9 9 9 9 9	9 9 9 9 9 9														

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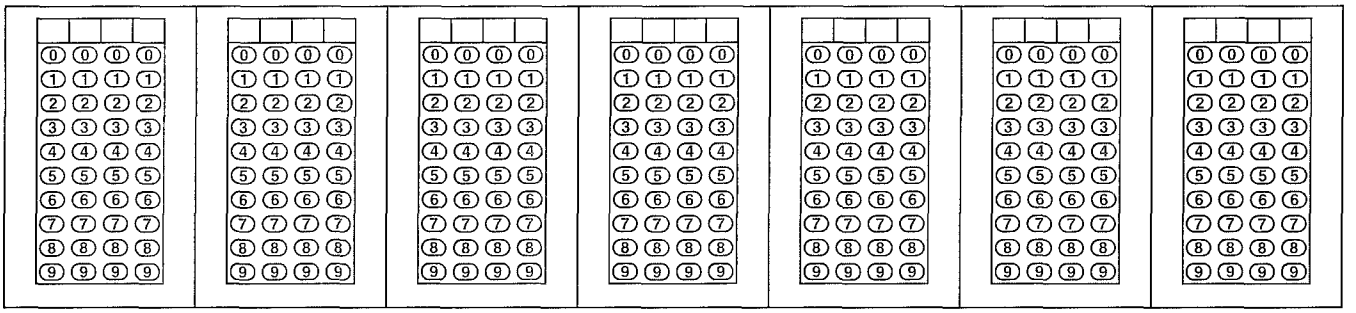
Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

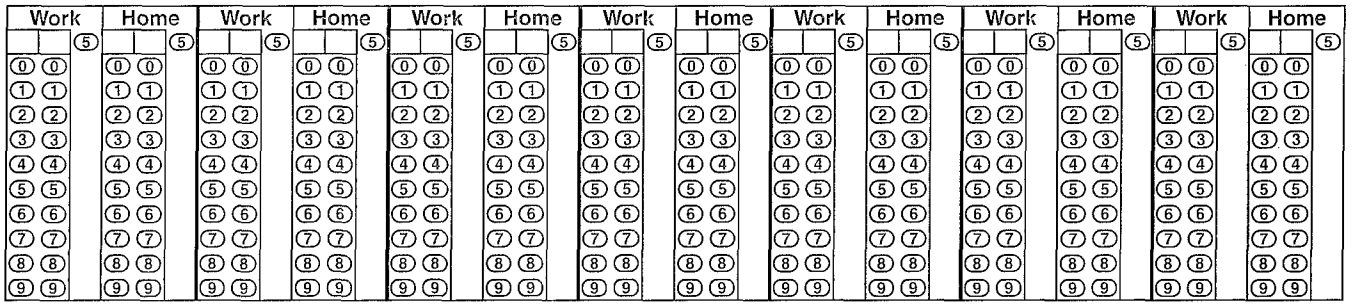
26) IF your BREATH was SAMPLED today, what time was your last cigarette or cigar before the sample? *(record military time)*



27-28) How many HOURS were you NEAR OTHER SMOKERS at WORK or at HOME today?

(Darken "5" bubble on right if total hours includes an additional half hour, e.g. 7.5 hours; otherwise, leave blank)

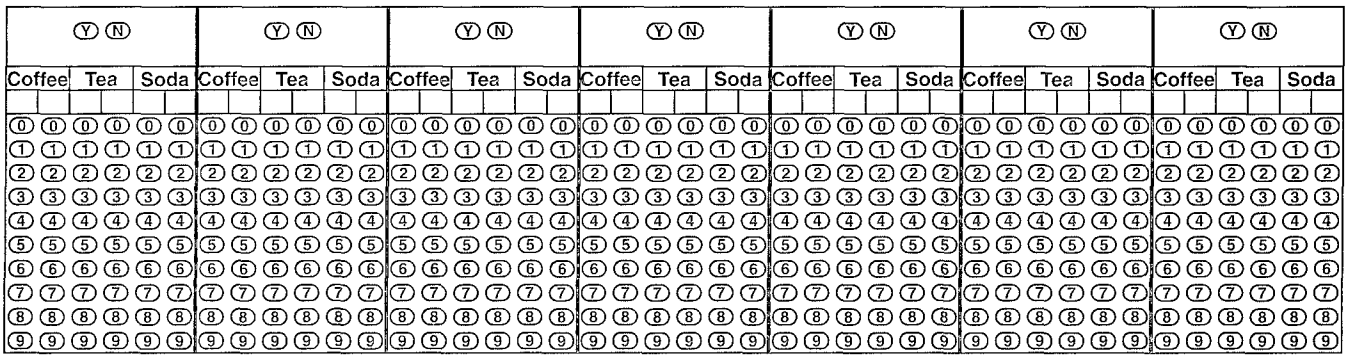
(2 hrs = 02)



29-31) Did you drink any CAFFEINATED coffee drinks, tea, or soda today? If YES: list total number of ounces (oz) of:

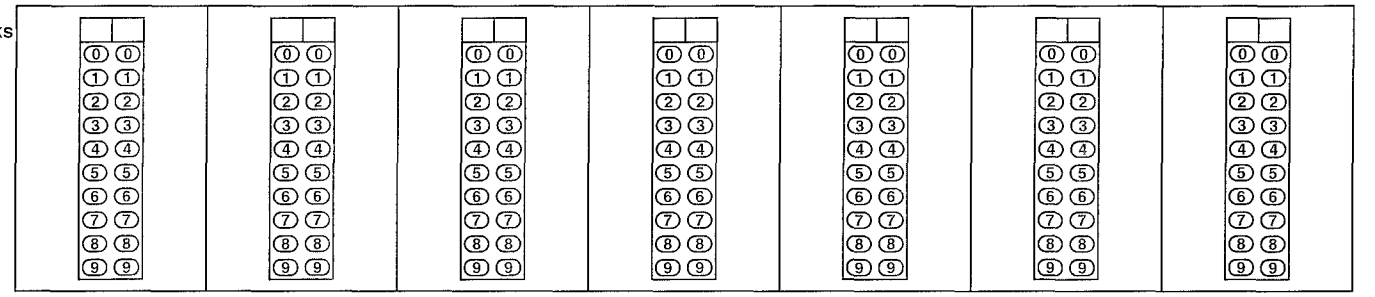
8 oz. = regular coffee cup; 12 oz. = mug, regular bottle or can (Do NOT include decaffeinated drinks)

(2 oz. = 02)



32) How many DRINKS of ALCOHOL did you consume today (e.g. wine, beer, liquor)? *(List the total number of drinks)*

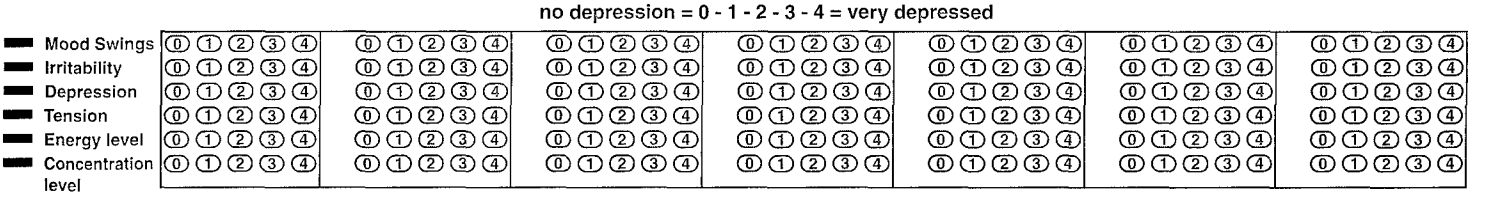
(2 drinks = 02)



33-38) On a scale of zero to four, please rate your FEELINGS today for the following states

e.g. no mood swings = 0 - 1 - 2 - 3 - 4 = severe mood swings

no depression = 0 - 1 - 2 - 3 - 4 = very depressed



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39) Did you work at the base today?

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Ⓨ Ⓝ	Ⓨ Ⓝ	Ⓨ Ⓝ	Ⓨ Ⓝ	Ⓨ Ⓝ	Ⓨ Ⓝ	Ⓨ Ⓝ

40) If YES: How many TOTAL HOURS did you work today, including classes? *(If NO, go to #44.)*

(Darken "5" bubble on right if total hours includes an additional half hour, e.g. 7.5 hours; otherwise, leave blank)

(2 hrs = 02)

⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9

41) What SHIFT did you work today? *(If worked a "double shift," record both shifts)*

Day Ⓓ Evening Ⓔ Night Ⓝ	Day Ⓓ Evening Ⓔ Night Ⓝ	Day Ⓓ Evening Ⓔ Night Ⓝ	Day Ⓓ Evening Ⓔ Night Ⓝ	Day Ⓓ Evening Ⓔ Night Ⓝ	Day Ⓓ Evening Ⓔ Night Ⓝ	Day Ⓓ Evening Ⓔ Night Ⓝ

42) In what SHOP or OFFICE did you work today? *(record name of shop or office)*

43) Did you perform an unusual JOB or JOB ACTIVITY(IES) today? *(If yes, describe job or activities)*

Ⓨ Ⓝ	Ⓨ Ⓝ	Ⓨ Ⓝ	Ⓨ Ⓝ	Ⓨ Ⓝ	Ⓨ Ⓝ	Ⓨ Ⓝ

44) Did you SMELL FUEL in the air today?

Ⓨ Ⓝ	Ⓨ Ⓝ	Ⓨ Ⓝ	Ⓨ Ⓝ	Ⓨ Ⓝ	Ⓨ Ⓝ	Ⓨ Ⓝ

45) IF YES: Did you SMELL FUEL while at work, outside of work? *(If NO, go to #49)*

Work Ⓦ Outside Ⓞ Both Ⓑ	Work Ⓦ Outside Ⓞ Both Ⓑ	Work Ⓦ Outside Ⓞ Both Ⓑ	Work Ⓦ Outside Ⓞ Both Ⓑ	Work Ⓦ Outside Ⓞ Both Ⓑ	Work Ⓦ Outside Ⓞ Both Ⓑ	Work Ⓦ Outside Ⓞ Both Ⓑ

46-47) How many HOURS were you exposed to...

Typical = TYPICAL levels of FUEL in the air today?

Higher = HIGHER than USUAL levels of FUEL in the air today?

(Darken "5" bubble on right if total hours includes an additional half hour, e.g. 7.5 hours; otherwise, leave blank)

Typical	Higher	Typical	Higher	Typical	Higher	Typical	Higher	Typical	Higher	Typical	Higher	Typical	Higher
(2 hrs = 02) ⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9

48) How many HOURS did you wear a respirator today? *(record total hours)*

(2 hrs = 02)

⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9	⑤ 0 1 2 3 4 5 6 7 8 9

For staff use only ☞☞☞ ID: _____ Week: _____

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

49) Did your skin come into contact with liquid FUEL today? *(If NO, go to #53)*

Ⓨ Ⓝ	Ⓨ Ⓝ	Ⓨ Ⓝ	Ⓨ Ⓝ	Ⓨ Ⓝ	Ⓨ Ⓝ	Ⓨ Ⓝ

50) Was FUEL on your SKIN while at Work, Outside of Work, or Both?
(Darken "5" bubble on right if total hours includes an additional half hour, e.g. 7.5 hours; otherwise, leave blank)

Work Ⓦ
Outside Ⓞ
Both Ⓑ

51) How many hours was FUEL on your SKIN today?
(1 hr = 01; 0 hrs = 00)

52) How many HOURS did you wear GLOVES or COVERALLS today?
(2 hrs = 02; 0 hrs = 00)

53) How many MINUTES were you exposed to exhaust today?
(5 min = 005; 0 min = 000)

54) How many HOURS were you exposed to SOLVENTS or PESTICIDES IN THE AIR today?
(e.g., degreasing cleaner, glue, paint, nail polish, nail polish remover, oil, weed killer, insect killer, varnish, lacquer)
(Darken "5" bubble on right if total hours includes an additional half hour, e.g. 7.5 hours; otherwise, leave blank)
(2 hrs = 02; 0 hrs = 00)

55) How many HOURS was your skin in contact with SOLVENTS or PESTICIDES today?
(e.g., degreasing cleaner, glue, paint, nail polish, nail polish remover, oil, weed killer, insect killer, varnish, lacquer)
(2 hrs = 02; 0 hrs = 00)

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

56) How many FLIGHTS of STAIRS did you climb today? *(assume 10 stairs per flight)*

(5 flights = 005)

57-58) How many MILES did you...

(2 mi = 02; 0 mi = 00)

Walk	Run

59) How many MINUTES did you RUN today?

(10 min = 010)

60-61) Today, _____, how many HOURS did you do light to moderate physical activity?

at work	off work

62-63) Today, _____, how many MINUTES did you do heavy (to the point of perspiration or breathing) physical activity?

(do not include running here)

at work	off work

IF YOU WORKED DURING THE LAST WEEK, PLEASE ANSWER QUESTIONS #64-75 AT THE END OF YOUR WORK WEEK

(T) (F) 64) I had to work very hard this week?
(T) (F) 65) I had an excessive amount of work this week?
(T) (F) 66) I did not have enough time to get my work done this week?
(T) (F) 67) I had to do a lot of repetitive work this week?
(T) (F) 68) I had a job that allowed me to be creative this week?
(T) (F) 69) I had a job that allowed me to learn new things this week?
(T) (F) 70) I had a lot of say about what happened this week?
(T) (F) 71) I had a lot of freedom to decide how to do my work this week?
(T) (F) 72) I worked with helpful people this week?
(T) (F) 73) I worked with people who took a personal interest in me this week?
(T) (F) 74) My supervisor was helpful this week?
(T) (F) 75) My supervisor was concerned about my welfare this week?

IF YOU ARE PROVIDING A *HOME* BREATH SAMPLE ON A *THURSDAY* OR *FRIDAY* EVENING, PLEASE ANSWER QUESTIONS #76-79 AFTER THE SAMPLE IS PROVIDED; OTHERWISE GO TO #80-83

ON THE *MONDAY MORNING* THAT YOU PROVIDE A *HOME* BREATH SAMPLE, PLEASE ANSWER QUESTIONS #80-83

	Thursday	Friday	Monday Morning
What TIME did you collect your BREATH SAMPLE at HOME? *(record military time)*	76) Time (0000–9999)	OR — Time (0000–9999)	80) Time (0000–9999)

After you left work, prior to your evening breath sample, were you exposed to:

Within 24 hours prior to your Monday morning breath sample, were you exposed to:

	Thursday Time	Thursday Date	Friday Time	Friday Date	Monday Morning Time	Monday Morning Date
Solvents, fuel odors or exhausts? *(if not exposed, record 0's in time & date blanks; otherwise, record date & time of last exposure before your first sample)*	77) (0000–9999)	(000000–999999)	(0000–9999)	(000000–999999)	81) (0000–9999)	(000000–999999)
OR						
Mouthwash, cough syrup or alcohol? *(if not exposed, record 0's in time & date blanks; otherwise, record date & time of last exposure before your first sample)*	78) (0000–9999)	(000000–999999)	(0000–9999)	(000000–999999)	82) (0000–9999)	(000000–999999)

79) Did you have any problems COLLECTING, STORING, OR TRANSPORTING your THURSDAY or FRIDAY EVENING BREATH SAMPLE?

If yes, please describe problem(s)

(Y) (N)

_____

_____

83) Did you have any problems COLLECTING, STORING, OR TRANSPORTING your MONDAY MORNING BREATH SAMPLE?

If yes, please describe problem(s)

(Y) (N)

_____

_____

APPENDIX III

SPECIAL MEASURES FOR THE WEEK OF BREATH SAMPLING:
FEMALE REPRODUCTIVE EFFECTS OF EXPOSURE
TO JET FUEL AT U.S. AIR FORCE BASES

The following measures will help us to obtain accurate estimates of your fuel exposure at work. We would like you to follow them for ***ONE WEEK***, *i.e., from the Monday before your first breath sample until the Monday morning of your final breath sample.*

- **Avoid self-service refueling of your vehicle or lawn mower this week (outside of work).**
- **Avoid mowing the lawn.**
- **Avoid smoking sections of businesses and break rooms; try to lessen your exposure to cigarette smoke from friends and relatives as much as possible, especially indoors.**
- **If you are an occasional smoker, please do not smoke until after the final (Monday) breath sample is provided.**
- **Avoid smoke from fireplaces, grill-outs and grilled/smoked/charred foods**
- **Avoid using pesticides/insecticides, paints/solvents – this includes fingernail polish and polish remover.**
- **Please avoid using products containing alcohol. Especially, 24 hours prior to your breath sample, please do not use alcohol, mouthwash or cough syrup.**
- **Even the best-laid plans sometimes go awry. If you are unable to avoid one or more of the exposures on this page, please tell us when you provide your breath sample. This will help us to interpret the results.**
- **If you live with others, please ask them to read and, if acceptable, sign the form below. Bring the signed form with you when you arrive to provide your breath sample.**

TO OTHER MEMBERS OF THE HOUSEHOLD: *In order to obtain an accurate picture of the subject's internal exposure to fuel while at work, we need to enlist your help. During the week of testing, you can assist us in the following ways:*

Please protect her from exposure to smoke <u>for one week</u> during testing by:

- Helping her to avoid smoke from stoves, fireplaces or grilling food, even outdoors
- If you smoke, do so outdoors and please do not smoke when she is in the car with you
- Fuel-up the gas tank for her so she doesn't inhale the fumes
- If the lawn has to be mowed, fuel the lawn mower and mow the lawn for her
- Post-pone painting, spraying pesticides/insecticides or using solvents if she might be in the area and inhale the fumes

We realize these requests may cause some inconvenience. If you have any questions before you sign, please leave a phone message for Susan Simpson at (513) 558-0229. Include your name, phone number and days/times when you can be reached. IF YOU ARE WILLING TO PERFORM THESE MEASURES, PLEASE SIGN BELOW:

_____

WORK WEEK PRE-BREATH SAMPLE CHECKLIST ID ___ ___ ___

Record Time Left Work: ___ ___ ___ ___ **Record Date:**___/___/___

1. ***In the PAST 24 HOURS, that is, since this time yesterday, have you had any of the following foods?.....IF YES, RECORD:***

			# of Servings:	*Eaten at (time):*
a) Hamburger, cheeseburger, meatloaf	Yes ❑	No ❑	___ ___	_____ _____
b) Hot dogs, lunch meat	Yes ❑	No ❑	___ ___	_____ _____
c) Whole milk	Yes ❑	No ❑	___ ___	_____ _____
d) Doughnuts, cookies, cake, pastry, pies	Yes ❑	No ❑	___ ___	_____ _____
e) Other beef	Yes ❑	No ❑	___ ___	_____ _____
f) Eggs	Yes ❑	No ❑	___ ___	_____ _____
g) Cheese, cheese spreads (excluding cottage cheese)	Yes ❑	No ❑	___ ___	_____ _____
h) Margarine or butter on bread rolls or on vegetables	Yes ❑	No ❑	___ ___	_____ _____
i) Other pork	Yes ❑	No ❑	___ ___	_____ _____
j) French fries, fried potatoes	Yes ❑	No ❑	___ ___	_____ _____
k) Snacks such as chips, popcorn (exclude if low fat)	Yes ❑	No ❑	___ ___	_____ _____
l) Bacon, sausage	Yes ❑	No ❑	___ ___	_____ _____
m) Fried chicken	Yes ❑	No ❑	___ ___	_____ _____

2. ***In the PAST WEEK, that is, one week ago today, did you...***

a)...use the self-service tank when refueling of your vehicle or lawn mower this week (outside of work)? Yes ❑ No ❑ ***If yes, which date(s):*** __/__/__ ; __/__/__; __/__/__

b)...mow the lawn? Yes ❑ No ❑ ***If yes, which date(s):*** __/__/__ ; __/__/__; __/__/__

c)...breathe smoke from stoves, fireplaces or grills? Yes ❑ No ❑
If yes, which date(s): __/__/__ ; __/__/__; __/__/__

d)...eat any grilled/smoked/charred foods? Yes ❑ No ❑
If yes, which date(s): __/__/__ ; __/__/__; __/__/__

e)...use pesticides/insecticides, paints/solvents – this includes fingernail polish and polish remover? Yes ❑ No ❑ ***If yes, which date(s):*** __/__/__ ; __/__/__; __/__/__

PLEASE REMOVE SHOES, HAT, JACKETS: *HT:* ____ ' _____ " *WT:* _____