National Human Exposure Assessment Survey (NHEXAS)

Maryland Study

Quality Systems and Implementation Plan for Human Exposure Assessment

Emory University
Atlanta, GA 30322

Cooperative Agreement CR 822038

Standard Operating Procedure **NHX/SOP-F06**

Title: Collection, Storage, and Shipment of Dermal Wipe Samples for Metal and Pesticide Analysis

Source: Harvard University/Johns Hopkins University

U.S. Environmental Protection Agency
Office of Research and Development
Human Exposure & Atmospheric Sciences Division
Human Exposure Research Branch

1. Title of Standard Operating Procedure

   Harvard University/Johns Hopkins University Standard Operating Procedure:
   F06 Collection, Storage, and Shipment of Dermal Wipe Samples for Metal and Pesticide Analysis, Rev. 1.0

2. Overview and Purpose

   This standard operating procedure (SOP) describes the procedure for collection of dermal wipe samples to be analyzed for metal content by the Trace Metals Laboratory at the Harvard School of Public Health (HSPH) and for pesticide content by Southwest Research Institute (SwRI). No samples will be analyzed for PAHs.

3. Discussion

   Exposure to pollutants via the dermal route can constitute an important fraction of total exposure for certain pollutants. While the dermal route is recognized as an important fraction of total exposure for children less than six years old, who typically have high hand-to-mouth contact, it is not clear how important the dermal route is for older individuals. NHEXAS will assess this route for indivuals age 10 and up. In addition to measuring the pollutant concentration in dust and soil, dermal wipes represent measurements one step further along the pathway of pollutant concentration in a medium, to potential exposure, to dose. Dermal wipes will be measured twice in each Cycle on the target individual: on day 1 for metal analysis, and on day 8 for pesticide analysis.

4. Personnel Responsibilities

   4.1 Sampler Preparation

   Sampler preparation is the responsibility of the interviewer.

   The FCC Clerk is responsible for preparing Field Packets (including printing ID labels and affixing them to forms) before sampling.

   4.2 Appointments and Reminders

   Making appointments and sending reminder letters are the responsibility of the FCC staff.

   4.3 Sample Collection

   Sample collection is the responsibility of the interviewer.

   4.4 Storage

   Immediate storage of the sample prior to return to the field coordination site is the responsibility of the interviewer. Custody will be turned over to the Field Study Coordinator or his/her designate, for storage at the field coordination site.

   4.5 Shipment

Shipment to the analytical laboratory is the responsibility of the Field Study Coordinator or his/her designate.

4.6 Analysis

Analytical laboratory personnel at HSPH and SwRI will be responsible for all aspects of the dermal wipe sample analysis.

5. Required Equipment and Reagents

5.1 Field Sampling

towelettes, commercially available, such as Walgreen's Brand Wet Wipes (to clean interviewer's hands)
disposable nitrile (or similar chemically resistant) gloves, not powdered
4" x 4" 6 ply cotton dressing sponges, pre-packaged 2 per sterile package (Johnson & Johnson SOF-WICKÔ or equivalent)
fiberglass utility tray (minimum size of 8" x 12")
stainless steel dressing forceps
2-propanol (isopropanol), pesticide residue analysis quality (Baxter B&J or equivalent) in original bottle (500 mL)
laboratory tissues, KimwipeÔ or similar
hand lotion sample
resealable plastic bag (Ziplok or equivalent)
trash bag

Metals (Day 1)	Pesticides (Day 8)
polyethylene sample jar with lid	glass sample jar with Teflon-lined lid (250-mL) cooler with dry ice (for dermal wipe and indoor air samples)

5.2 Sample Tracking and Paperwork

Metals (Day 1)	Pesticides (Day 8)
9 sample ID labels with sample type 41 for "dermal wipe for metals" sample: 3 for logsheets, 1 for chain-of-custody form, 1 for sample jar, 4 spare	9 sample ID labels with sample type 42 for "dermal wipe for pesticides" sample: 3 for logsheets, 1 for chain-of-custody form, 1 for sample jar, 4 spare

Field Packet for household: logsheets, chain-of-custody forms
Field Manual (SOPs)
clipboard
pens, ballpoint

6. Procedure

6.1 Preparation for Collection

When scheduling a visit, the FCC staff will:

Ø Ask the target individual to abstain, if possible, from hand washing for two hours prior to the visit. Some studies indicate the need for a two-hour hand dust equilibration time (Aschengrau et al.).

The FCC Clerk will:

Ø Print ID labels and inspect them to make sure that they are correct for the household, Cycle, and sample types.

Ø Affix 3 ID labels to the 3 layers of the logsheet, and one ID label to the chain-of-custody form.

Ø Affix an ID label to the sample jar: sample type 41 for metals or 42 for pesticides. Place the jar and spare ID labels in a plastic bag and seal the bag.

The Interviewer will:

Ø Check the isopropanol bottle in your tote box. If it is less than half full, get an extra bottle.

Ø Make sure that all paperwork is present and that the ID labels are correct. Pack the tote boxes to go to the field.

6.2 Selection of Sampling Location(s)

Ø Select an area free from sources of potential metal and pesticide contamination to perform the hand wipe sample collection whenever possible. An indoor area not directly related to hands-on farm, garden, or workshop activities is suitable. Usually a kitchen table, if available, is suitable.

6.3 Sample Collection Procedure

The interviewer will:

Ø Record on the logsheet the date and time, and your name.

Ø Ask when the target individual last washed his/her hands and record the time on the logsheet. Record on the logsheet the condition of the target individual's hands, e.g., cuts, paint stains, or dirty fingernails.

Ø Before handling the gloves or other equipment, clean your own hands with a disposable towelette. Discard the towelette in the trash bag. Put on gloves.

Ø With a gloved hand wipe the tray with a clean laboratory tissue wetted with isopropanol. Clean the forceps with isopropanol and place them on the tray.

Ø Open an undamaged package of two sterile 4" x 4" dressing sponges. Use the forceps to

place them apart and flat on the tray.

- Ø Uniformly moisten one dressing with isopropanol.

- Ø Pick up the dressing from the tray, unfold it, and thoroughly wipe the palm and backside of each of the target individual's hands. Turn the dressing so that fresh surfaces are exposed as the wiping process progresses.

- Ø Place the dressing in a clean sample jar. Cap the jar temporarily.

- Ø Uniformly lace the second dressing with isopropanol. Wipe the palm side of the target individual's hands and around each digit including the thumb. Turn the dressing so that fresh surfaces are exposed as the wiping process progresses.

- Ø Place the second exposed dressing in the sample jar.

Metals	Pesticides
Cap the sample jar tightly. Place it in the tote box.	Add 50 mL isopropanol to the dressings in the sample jar and cap tightly. Transfer the sample jar to a sample cooler with dry ice.

- Ø Offer the target individual a hand lotion sample. Remind the target individual that Harvard and other organizations involved in the NHEXAS study do not endorse any products.

6.4 Labeling of Sample

A unique ID number will be assigned for each sample (see SOP "Identification Numbers"). Printed labels will show the ID number in bar-code and human-readable format. The interviewer will affix identical labels to the sample container, the logsheet, and the chain-of-custody form.

6.5 Preservation and Storage

At the FCC, transfer custody of the sample to the Field Coordinator or his designate. See HSPH SOP G05, "Storage and Shipping of Samples."

Metals	Pesticides
Place the sample jar in a designated storage area until it is shipped for analysis.	Store the sample jar with dry ice until it is shipped for analysis.

6.6 Handling and Shipping

Arrangements will be made with HSPH for timely shipment of samples. It is expected that shipments will occur on a weekly basis. See HSPH SOP G05, "Storage and Shipping of Samples."

Metals	Pesticides
No special precautions in handling or shipping are needed.	Samples will be packed with dry ice to keep them cold during shipping.

6.7 Laboratory Analysis

The two dressings in each sample will be composited for analysis.

Metals	Pesticides
Samples will be analyzed at the HSPH Trace Metals Laboratory.	Samples will be analyzed at SwRI.

6.8 Data Workup

Field and laboratory data will be returned to Harvard in both magnetic and hardcopy format. Data will be coded and checked, computer entry verified, and discrepancies resolved. Analytical results will then be merged with questionnaires and other data, using the ID number as the merge parameter. The quantity of metal found will be reported as μg/pair hands. The quantity of pesticide found will be reported as ng/pair hands.

6.9 Sample Tracking

The ID number will allow tracking of each sample. A data base management system will ensure knowledge of the status and location of any sample at any time including retrospectively.
The chain-of-custody form will accompany the sample wherever it goes. Anyone who receives, transfers, or ships the sample will sign and date it, and keep a photocopy. It must clearly contain all necessary information so that the custody of the sample can be determined at any time. Airbills, bills of lading, etc., are acceptable substitutes when a commercial or government carrier is used; copies of such bills will be attached to the chain-of-custody form.

7. Quality Assurance Procedures

7.1 Laboratory and Field Blanks

A field blank will be collected at regular intervals (every tenth sampled individual). The field blank will be prepared by removing two dressings from a package and handling them in a manner simulating sample collection. The dressings will be placed in a jar labeled with a unique identifying number.

Laboratory blanks will be prepared as discussed in the appropriate extraction SOP. The laboratory analysts will have no knowledge of which samples are blanks.

7.2 Duplicate Sampling

No mechanism for duplicate sample collection has been devised, hence no duplicate samples will be carried out.

7.3 Tolerance Limits, Detection Limits, and Sensitivity Limits

The tolerance limits, detection limits, and sensitivity limits for the method will be determined through analysis of blank and replicate analytical measurements.

The table below shows expected masses (per sample) of metals and pesticides, and equivalent limits of detection given the sampling protocol.

Category	Pollutant	Expected Mass per Sample	Expected Limit of Detection Given Sampling Protocol
Metals	Arsenic	< 700 ng	700. ng
	Cadmium	< 25 ng	25. ng
	Chromium	< 125 ng	125. ng
	Lead	< 150 ng	150. ng
Pesticides	Chlordane	ND to 1000 ng	70. ng
	Chlorpyrifos	ND to 10,000 ng	150. ng
	4,4'-DDD	10-100 ng	5. ng
	4,4'-DDE	5-1000 ng	5. ng
	4,4'-DDT	10-4500 ng	5. ng
	Dieldrin	50-1000 ng	5. ng
	Heptachlor	2-500 ng	1. ng
	Malathion	ND to 1000 ng	110. ng

8. References

Aschengrau, Ann, Robert Bornschein, Merrill Brophy, et al. *Three City Urban Soil-Lead Demonstration Project: Protocols for Sampling and Analysis of Soils, Dust, and Handwipes*. Internal EPA document, October 1991.

Harvard University/Johns Hopkins University Standard Operating Procedures:
G03 Identification Numbers for Samples and Forms
G04 Chain-of-Custody and Sample Tracking
G05 Storage and Shipping of Samples
G06 Problem Management
L06 Extraction of Metals from Sampling Media
L07 Analysis of Metals by GF-AAS
L08 Analysis of Metals by ICP-MS
L14 Determination of Pesticides, Acid Herbicides, and PAHs by GC/MS
L15 Extraction of Neutral Pesticides and Acid Herbicides from Isopropanol Handwipes

Que Hee, Shane S., Belinda Peace, C. Scott Clark, et al. "Evolution of Efficient Methods to Sample Lead Sources, Such as House Dust and Hand Dust, in the Homes of Children", *Environmental Research,* 38:77-95 (1985).

SwRI SOP 01-17-08 Extraction of Neutral Pesticides, Acid Herbicides and Phenols from

Isopropanol Wipes