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-G09**

Title: Training of Laboratory Technicians

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 Procedures:
G09 Training of Laboratory Technicians, Rev. 1.0

2 Overview and Purpose

This SOP describes the training for new laboratory technicians at HSPH's Trace Metals Laboratory. The training is intended to provide a sound understanding of the tasks for which they are responsible so that they can work accurately and efficiently in a safe, comfortable environment.

The overall responsibilities of the lab technician (LT) are:

Ø To prepare, extract, and analyze samples accurately.

Ø To keep meticulous records of sample handling and other laboratory activity.

3 Discussion

This SOP lists the steps in the training each lab technician must have. Also it describes the issues involved for each step. The lab technician is expected to complete each step satisfactorily in a reasonable period.

This and the related training, general, and laboratory SOPs will be the basis for laboratory manuals to be used by staff. For details such as how to extract a sample, refer to the appropriate SOPs (see References).

Qualifications for LT positions include a bachelor's degree in chemistry (preferred) or another scientific or technical field. Laboratory experience is preferred.

4 Personnel Responsibilities

4.1 Planning Training Curriculum
Harvard personnel will plan the curriculum for the training session.

4.2 Hiring Field Technicians
Candidates for LT positions will be interviewed and selected by HSPH personnel, including the Laboratory Supervisor, the QA Officer, and the Principal Investigator.

4.3 Training Field Technicians
Training for the technicians will take place at HSPH.

4.4 Audits
Audits will be performed by HSPH and/or JHU personnel, and by an independent entity. See Section 8.2.

5 Required Equipment and Reagents

Laboratory Manual (including SOPs)
laboratory equipment (listed in SOP for each medium)
computer with database and/or spreadsheet software
labels, forms

6 Responsibilities of Laboratory Technicians

Responsibilities of the Lab Technician include:

Category	Responsibility	SOP
Record keeping	Receives samples from the field; sometimes from the lab supervisor.	G03, G04
	Maintains up-to-date records of all sample activity, using the database.	all
	Stores samples in appropriate locations and conditions, and ships samples correctly.	G05
	Reports any problems accurately to the appropriate person.	G06
	Prepares analytical reports.	L07, L08
	Completes necessary administrative paperwork.	---
	Orders supplies, inspects them, and logs them in.	L01
Sample preparation and analysis	Cleans glass and plastic containers.	L02
	Operates the Milli-Q water purification system.	L03
	Weighs samples and containers.	L04
	Prepares samples for extraction or analysis.	L05
	Carries out sample extraction procedures.	L06
	Performs calibrations, analyzes samples, and calculates analytical results.	L07, L08
	Carries out Good Laboratory Practices.	---

7 Curriculum

The laboratory technician will learn how to:

7.1 Recordkeeping

7.1.1 Receive and Track Samples

- Ø use a bar code reader.
- Ø use the database software.
- Ø the system of ID numbers.
- Ø handle chain-of-custody forms.
- Ø inspect filters for holes and other problems.
- Ø inspect sample containers for damage.

7.1.2 Store and Ship Samples and Extracts

- Ø necessary conditions for each type of sample and extract.
- Ø locations and organization of refrigerators and other storage equipment.
- Ø appropriate conditions and sealing for storage.
- Ø ship samples and extracts to other laboratories.

7.1.3 Purchase Supplies and Equipment

- Ø keep inventory and know when supplies are needed.
- Ø use specifications memos to choose the appropriate type and quality of supplies.
- Ø purchasing procedures.
- Ø receive, inspect, and log in purchases.
- Ø store supplies and equipment in the proper locations.

7.1.4 Prepare Analytical Reports

- Ø prepare analytical reports.
- Ø describe any problems in the analysis and what effect they may have had on

the results.

7.1.5 Administrative Paperwork

- Ø prepare time sheets
- Ø handle any other administrative paperwork

7.2 Sample Preparation and Analysis

7.2.1 Safety and Good Laboratory Practices

- Ø use appropriate safety equipment such as gloves, goggles, and lab coats.
- Ø use hoods and other equipment properly.
- Ø handle reagents safely.
- Ø dispose of used solutions, broken glass, and hazardous waste properly.
- Ø report accidents.
- Ø follow Good Laboratory Practices.

7.2.2 Clean Glassware and Plasticware

- Ø prepare solutions
- Ø wash, rinse, and dry containers thoroughly.
- Ø use a drying oven.
- Ø use a sonicator.
- Ø acid wash containers.

7.2.3 Operate a Milli-Q System

- Ø use a conductivity meter.
- Ø read and interpret meters and indicator lights.
- Ø turn the system on and off.
- Ø record conductivity tests. etc. in logbook.

7.2.4 Use a Balance

- Ø calibrate and use laboratory balances.
- Ø keep records of balance use.
- Ø handle and/or report any problems.
- Ø use the appropriate balance for the mass of the object and the precision needed.

7.2.5 Using Other Laboratory Equipment

- Ø use and calibrate a flowmeter to calibrate rotameters.
- Ø use and calibrate automatic pipettes

7.2.6 Sieve and Divide Samples

- Ø dry soil samples.
- Ø use a sieve shaker.
- Ø use a Jones riffler.
- Ø split samples accurately and store or ship them properly.
- Ø sieve soil and dust samples.
- Ø enter data into the database.
- Ø prepare replicate samples.

7.2.7 Extract Samples

- Ø do acid digestion of air filters, dust, soil, and dermal wipes.
- Ø prepare extracts for GF-AAS and ICP-MS analysis.
- Ø prepare and extract laboratory blanks.
- Ø prepare and analyze samples with spikes,

7.2.8 Analyze Samples

- Ø maintain and prepare the GF-AAS instrument.
- Ø calibrate the instrument and analyze Standard Reference Materials.
- Ø prepare serial dilutions.
- Ø use the instrument to analyze samples.
- Ø create and store data files.
- Ø understand the data output and explain any problems.

8. Quality Assurance Procedures

8.1 Testing

8.1.1 During Training

- Ø The lab supervisor will routinely monitor the lab technician until the LT has demonstrated proficiency in all procedures.

- Ø At this stage, the lab supervisor will assign to the lab technician some previously analyzed samples including intercomparison samples. These will have to be analyzed with results within previously defined acceptable limits from the given value. **The lab technician will not be allowed to analyze real samples until this plateau has been reached.** Upon successful completion of these analyses, the lab technician will be certified to analyze unknown samples using the given SOP.

8.1.2 After Training

- Ø In addition to the initial training period, the lab technician will routinely have to analyze blanks, duplicate samples, intracomparison samples, and externally generated intercomparison proficiency test samples. Reported results must be within acceptable limits of the known values. If results are not within these limits, then first the reason(s) will be determined if possible, and then retraining will be implemented as needed.

8.2 Audits

Internal audits using QA samples will be performed monthly by HSPH personnel. External audits will be performed during the study by an independent entity acceptable to EPA.

9. References

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
G07 Training of Technicians
G08 Training of Interviewers
G10 Training of Phlebotomists
G11 Training of Field Coordination Center Staff
L01 Purchase of Consumables
L02 Cleaning of Glass and Plastic Containers
L03 Operation of a High Purity Water System
L04 Balance Operation
L05 Sieving and Division of Dust and Soil Samples

L06 Extraction of Metals from Sampling Media
L07 Analysis of Metals by GF-AAS
L08 Analysis of Metals by ICP-MS