

ENVIRONMENTAL
SAMPLING PROTOCOLS
FOR LEAD
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Introduction

These sample collection protocols should be used in the collection of all environmental samples collected by state or county personnel in the course of follow-up evaluations of households found to have at least one person with elevated blood lead.

The determination as to how many and what kinds of samples should be collected at a given site will be made by the state or county Environmental Health Specialist in consultation with the Oregon Public Health Division, Lead Poisoning Prevention Program (LPPP) or the Lead-Based Paint Program (LBPP). Sample testing under this program will be authorized only in cases where a child (under age 18) in the household has been found to have a confirmed (venous draw) lead level of 10 µg/dl or greater or with approval from the CLPPP. Sample collection containers, equipment and specific instructions will be ordered and sent to you on a case-by-case basis by the LPPP.

The responses obtained to questions on the “Environmental History and Investigation” questionnaire and a site visit will guide the decisions as to what kind of samples, if any, should be collected for analysis. The field investigator should make the decision as to what kind of, and how many, samples should be taken from a given home or exposure environment. Consultation will be provided by the LPPP as needed.

The following section, *Sampling Methods for Environmental Assessment*, contains the protocols for the collection and/or analysis of samples of various kinds of environmental materials for testing for the presence of lead. The LPPP Lead Consultant will send sampling kits and necessary protocols to the county investigators. All requests and consultations should be processed through the LPPP Lead Consultant to avoid duplication of effort and to avoid any confusion.

Note that this section has been divided into two subsections - state and county EHS and LPPP. The sampling described in the LPPP section requires special equipment and/or is not commonly used during EBLL investigations. If you have questions regarding a particular sampling procedure, contact the LPPP.

Also note that following the section on sampling procedures, there is a section detailing the contents and compilation of an EBLL report. Please follow these steps when completing an EBLL report.

Sampling Methods for Environmental Assessment: state and county environmental health specialists or nurses

REMEMBER: all debris that you generate during sampling must leave the investigation site with you. Garbage bags are included in the EBLL kit.

Put on shoe covers before entering home to avoid tracking in lead dust and debris.

Surface Dust Wipe Sampling

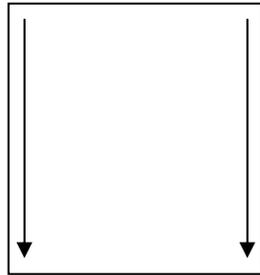
Surface dust wipe sampling data can be related directly to health potential by showing the mass of lead available per unit of surface area ($\mu\text{g}/\text{ft}^2$). **Recent studies have shown that dust lead levels are the strongest predictor of children's blood lead levels compared with a number of other variables.** Taking dust wipe samples is therefore essential to the investigation. In premises that require on-site home/environmental evaluation, dust wipe sampling will be a part of most evaluations.

Wipe samples for settled dust may be collected from floors (both carpeted and uncarpeted); interior windowsills and window troughs (wells); and other reasonably smooth surfaces (e.g., porches, stair treads, bookshelves).

The sampling kit includes a supply of dust wipes, disposable gloves, polyethylene centrifuge tubes, and a chain-of-custody form. If any of these items are not in the kit, contact the LPPP consultant before going to the home for the investigation.

1. Identify areas to be tested; be specific (e.g., child's bedroom floor and left side window trough; kitchen floor to the left of back door, and family room floor underneath window). A floor/plot plan grid is included in the EBLL kit. Do not walk on or touch the surface to be sampled.
2. If a template is provided with your sampling kit, wipe all surfaces of the template with a dust wipe to prevent contamination of surface to be sampled. Handle template by outside edges and carefully secure template to the surface to be sampled by taping the outside corners of it to the surface. Once the template has been placed on the surface, do not move it. Do not touch the test surface.
3. If a template is not provided use two-inch masking tape to outline a square or rectangular surface that you can accurately measure after sampling is completed. If possible, this should be a minimum of 16 square inches (e.g., 4"x4" or 8"x2"). After sampling is completed note the length and width to within 1/8" as well as the units of measurement of the tested area and record it on the sampling form. The laboratory will calculate the concentration of lead in standard units.
4. Loosen the cap of a polyethylene centrifuge tube and place it near the surface to be sampled. Make a small tear in a dust wipe packet and place it near the area to be sampled being careful not to contaminate the tube and wipes.
5. Put on clean disposable gloves being careful to only touch gloves at the wrist to avoid contaminating them (use a new pair of gloves for each sample collected).

6. Remove dust wipe from its packet, open it fully, then refold it in half two times.
7. First Wipe Pass (side-to-side). See following diagram. With the fingers together, press down firmly beginning in one interior corner of the template or tape and wipe down one side (1). Being careful to keep wipe within the perimeter of the template/tape, repeat on the opposite side (2). Again, keeping wipe inside the perimeter of the template/tape, wipe along the top, inside perimeter of the template/tape then from side to side in as many S-like motions as needed to cover the entire wipe area. At the end of the last 'S', sweep toward the middle of the surface and pinch debris into the wipe, folding it once so that contaminants are trapped in the wipe.



8. Second Wipe Pass (top-to-bottom). Repeat the above procedure using the same wipe and S-like motion but at a 90° angle to the first. Attempt to remove all visible dust or paint chips. Fold contaminated side inward again and insert wipe into centrifuge tube (ONLY one wipe per centrifuge tube).
9. Replace cap on tube loosely.
10. If the area is heavily dust laden, a smaller area should be wiped. If the surface is a windowsill or trough, use a lengthwise motion for all passes of the wipe and attempt to include as much paint chip debris as possible. Avoid collecting large debris such as twigs, etc.
11. Close the tube and label it. Remove and discard gloves. Record the laboratory number on the sample form and describe the sample location completely (e.g., floor in youngest child's bedroom next to the closet).

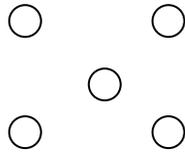
If using tape, after sampling measure the surface area wiped to the nearest eighth of an inch and record on the field sampling form. If you have used a template, record the dimensions that are printed on template, and wipe it with a dust wipe between samples to prevent cross-contamination of samples.

13. **Fill out the chain-of-custody forms completely** (see sample in EBLL kit).
14. Collect additional surface wipe samples in all locations that are likely exposure points, especially areas accessible to children.
15. In most cases, a total of 6-8 dust wipes are taken at each location. In homes built after 1978, dust wipes may not be needed.

Soil Sampling

If soils are considered a likely source of exposure to the occupants of a premise, soil samples should be collected and submitted for testing. Usually only one or two soil samples are needed.

1. Determine location for soil sample. Sample(s) should be taken from areas of bare soil that are frequented by the occupant(s) being evaluated (and pets), including ALL play areas and obvious pathways from which soil could be tracked into the house by humans or pets. Samples may also be collected from the dripline if soil is bare.
2. Visualize a sample area that is approximately one foot square (1' x 1'). This is not a precise measurement and so does not require a specific, measured area.
3. Collect 5 spoonfuls of soil from the top 1/2" of soil and place in a plastic bag. (Avoid collecting rocks, twigs, etc. If there are paint chips in the soil sample collect them, but do not attempt to oversample paint chips.) Recommend using a pattern like that diagramed below. (The purpose of this test is to determine lead levels that can be tracked into the house or ingested during normal play. As such, the loose surface soil should be tested as much as possible. In frozen conditions, use a chisel or other device to loosen no more than the top 1/2".)



If the drip line of a unit is to be tested, take between 5 and 10 subsamples along the line spaced every 6 inches. Note the size of the sample area. See following diagram.



4. Seal bag. Label with sample location, date, time, etc. Thoroughly mix soil so it is of uniform consistency.
5. Briefly sketch property and indicate sample location(s) on sketch using floor/plot plan grid provided.
6. Discard spoon. If soil is sampled at more than one location, you must use a different spoon (and bag) for each sample location.

Food, Beverage or Home Remedy Sampling

Only if the interview and environmental assessment strongly suggest that a particular food, beverage, home remedy or other material that may contain dangerous levels of lead is ingested regularly, should samples of any of these materials be taken. *Examples of home remedies that should be sampled are Azarcon, Greta, and Kohl.* Commercially prepared foods and beverages, prescribed medications, over-the-counter remedies, and most home prepared and preserved products should be considered safe. Only if a food, beverage, medication or remedy is extraordinary in its source or in the techniques used to prepare it, should it be suspect. Examples include, homemade beverages that are distilled, fermented or aged in vessels that contain lead and/or leaded glaze, galvanized surfaces, solders, enamel, paints or other unidentifiable metal components; ethnic home remedies prepared in unconventional or unknown ways; home canned foods that are in unconventional metal containers or those with soldered seams; foods stored in ANY ceramic container; and imported foods that are in atypical containers (e.g., not found in most stores).

Drinking Water Samples

Information about the source water often may be obtained from the water utility. For more information on specific water systems, check the Drinking Water Program Web site or call 971-673-0405. In order to take a sample of drinking water that will give you accurate information about lead content, you must take a 'first draw' sample. 'First draw' water is water that has been sitting in the household for at least 6 hours (e.g. overnight or the duration of the work day). It is imperative that no water has been run during the course of this 6+ hour period.

Protocol for homes without a well

1. Use the 1-liter sampling bottle for inorganic metals testing from the laboratory (in kit).
2. Take the sample from the cold water tap at the kitchen sink.
3. Do **not** run water before starting collection. Fill the sample container completely with cold water from the kitchen tap. Remember that this water must be a 'first draw' sample.
4. Replace the sample bottle cap securely.
5. Label sample bottle and fill out lab paperwork completely.
6. Pack sample as directed by laboratory and ship to the laboratory for testing on the same day.
7. Aseptic collection technique is not essential, but it is important that the inside of the sample bottle and cap not be touched or otherwise contaminated before, during or after sampling.

Protocol for homes with wells

Nationally and locally, water is not usually the primary source of exposure, so water sampling should only be done when other possible lead sources have been ruled out. Water sampling from homes with wells is essentially the same as sampling from other homes; the difference is that you do not have access to an analysis of the source water (e.g., an annual report from water system). Therefore, you must take an additional sample. Again, water must have been standing for at least 6 hours.

1. Take a water sample at the surge tank (at the well head) using the following steps. Open the drain at the bottom of the tank for a 2-one thousand count, which flushes the valve. Then completely fill a 250 ml bottle and replace the cap.
2. Take ‘first draw’ sample from cold water kitchen tap as specified above.
3. Return to the well head, drain the surge tank and refill it. Now you are able to take a sample of the source water. Follow the steps for sampling the surge tank.

Although three water samples may seem like too many, having the data from all three allows you to identify, or discount, as a source of lead the plumbing, the surge tank and/or the source water.

Surface Swab Indicator Test Kits

Commercial Swab Kits are a useful **screening** tool in the detection of lead on solid surfaces, especially ceramic dishware. Surface swab indicator kits (Lead Check Kits) are provided in the investigation sampling kits. The Lead Check swab is only good for one test, however by dripping the test solution on the surface being tested and wiping (swabbing) the solution with a cotton swab rather than with the tip of the Lead Check swab you can get up to five tests. Cotton swabs are provided in the investigation sampling kits.

It is crucial that the manufacturer’s instructions be carefully followed in using the kits. The test kits are a non-quantitative, presumptive test for the presence of **leachable (surface) lead**. It should only be used as a screening tool. Quality control checks are contained in the kit.

1. Obtain the “Lead Check” testing kit or any of several commercially available “home testing kits” designed for testing solid surfaces such as ceramics, metal, wood, brick, cement, and other surfaces that are potential lead sources in homes.
2. Identify surface areas on the premise that are likely to be a contributing factor to lead exposure of the occupants (e.g., ceramic dishware, painted cupboards, shelves, sills, doors, doorjambs, countertops, dishes, bathtubs, toys, pottery, mini-blinds, etc.).
3. For each surface to be tested, follow the instructions provided by the manufacturer of the kit. Generally the test involves wiping (swabbing) the test solution over a small area. If testing painted object, it is important that all layers of paint on the test surface be exposed. In order to test all layers of paint, you must cut through the paint to allow the solution to penetrate all layers. Use a utility knife to cut out a half moon shaped area. Hold the knife at a 45° angle to the surface and expose as much of each layer as possible, cutting completely down to the substrate.

4. If the swab tip and/or test surface turns a pink or reddish color, the test is positive. If the swab shows no color change, the test is negative. There are time restraints and quality control verifications that apply to the testing. *Follow the manufacturer's instructions.*

Paint Chip Sampling

Taking paint chip samples will cause minor damage to the surface being sampled and may increase the hazard of exposure, so it is not recommended unless absolutely necessary. **The amount of lead in house dust is more predictive of elevated blood lead levels in children than is the amount or concentration of lead in paint and therefore paint chip sampling is not as useful as dust wipe results in determining possible source of exposure.**

Protocol for paint chip sampling on sheetrock or wood

RULES: Sample area must be precise, known area (1" x 1"). You must take all layers of paint.

1. Determine sampling area. If possible take sample in an unobtrusive location. Sample must be exactly one inch by one inch (1" x 1").
2. Place 2 strips of good grade (e.g. lab or paint tape; not duct tape) 1 inch wide tape next to each other over sampling area (as shown below).



3. Mark 1"x1" sample area on tape - use template.
4. With utility knife, score along marked lines through paint into subsurface.
5. Hold chisel at ~45° angle and strike with hammer (don't be timid). Increase angle and strike again. Continue until the complete 1" square of tape with attached paint has been removed from surface. **DO NOT LEAVE ANY PAINT ON THE SAMPLING SURFACE IN THE SAMPLED AREA.**
6. Place sample in labeled sample tube and record sample location and size on sample form.

If you take a paint chip sample, the damage should be repaired using lead-safe work practices.

****NOTE:** By using this technique the results can be reported in mg/cm^2 , which tells you how much lead is in that defined area. Do not have results analyzed for percent by weight; the amount of lead can be diluted depending on how many layers of paint have been put on the surface.

Sampling Methods for Environmental Assessment: State

X-Ray Fluorescence (XRF) Testing

X-ray fluorescent field analyzers can measure lead content directly on a variety of household surfaces. XRF analysis is the only technique by which it is feasible to survey all or most painted surfaces in a home for lead content. XRF results are obtained quickly, on-site, without damaging or destroying the surface being tested. It measures total lead of all combined layers of paint. A typical three-bedroom house can be thoroughly lead-screened in about two to three hours. An XRF also has the ability to measure the lead content in soil and dust. There are some limitations to the performance measures of XRF.

NOTE: This is not a comprehensive list of testing/sampling options; it is simply a description of the samples most commonly collected in EBLI investigations in Oregon. If you believe that you need to take some type of sample that is not addressed in this document, please contact the LPPP for additional information.

Recommendations and Follow-Up

At the completion of the environmental investigation, the investigator will submit copies of the following documents to the LPPP: Environmental History and Investigation Questionnaire, environmental sampling results, and follow-up letter with recommendations.