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# Lead Poisoning

DRAFT: 10/10/2024

**1. DISEASE REPORTING**

**1.1 Purpose of Reporting and Surveillance**

1. To assess the magnitude of lead exposure in Oregon.
2. To identify all tested individuals with blood lead levels (BLLs) at or above the blood lead reference value (BLRV).
3. To identify the sources of lead exposure for individuals and to identify, notify, and evaluate others who may be at risk from those sources.
4. To ensure that individuals with BLLs at or above the BLRV receive proper medical management, including follow-up, until their blood lead concentration drops below the BLRV.
5. To ensure that adequate environmental follow-up occurs, to reduce or eliminate the risk of further lead exposure from identified sources for the affected child and any family members, playmates, etc. who could also be exposed to the same source.
6. For occupational exposures, to ensure that the Oregon Occupational Safety and Health Division (OR-OSHA) is aware in a timely manner.

**1.2 Laboratory Disease Reporting Requirements**

1. Laboratories must report all blood lead test results directly to the local public health authority or Oregon Health Authority (OHA) within seven days [[333-018-0015 3(d)](https://secure.sos.state.or.us/oard/view.action?ruleNumber=333-018-0015)]. Blood lead levels at or above the blood lead reference value (≥ 3.5 µg/dL) must be reported within one local public health authority working day [[333-018-0015 3(c)](https://secure.sos.state.or.us/oard/view.action?ruleNumber=333-018-0015)(A)]; results may be sent electronically or faxed to (971) 673-0457.
2. Oregon law 333-018-0013 requires labs that send an average of >30 records per month to OHA to submit the data electronically. Please contact OHA at 971-673-1111 for Electronic Laboratory Reporting (ELR) initiation, assistance and approval.

**1.3 Clinician Disease Reporting Requirements**

1. Clinicians using point-of-care portable analyzers for blood lead testing are required to report all blood lead test results directly to the local public health authority or OHA within seven days [[333-018-0015 3(d)](https://secure.sos.state.or.us/oard/view.action?ruleNumber=333-018-0015)]. Blood lead levels at or above the blood lead reference value must be reported within one local health department working day [[333-018-0015 3(c)](https://secure.sos.state.or.us/oard/view.action?ruleNumber=333-018-0015)(A)]; results can be sent electronically or faxed to (971) 673-0457. For more information on reporting, contact OHA at 971-673-0440.

**1.4 Local Health Authority Reporting and Follow-Up Responsibilities**

1. OHA will refer childhood lead exposure reports received directly from labs or clinicians to Local Public Health Authorities (LPHA) for follow-up. If the LPHA is notified directly of a test result, they should report the case to OHA via the Oregon Public Health Epidemiologists’ User System (Orpheus).
2. Forms used for reporting and recording the results of follow-up investigations are available from the Lead Poisoning Prevention Program at (971) 673-0440 or at [www.healthoregon.org/lead](http://public.health.oregon.gov/HealthyEnvironments/HealthyNeighborhoods/LeadPoisoning/CountyHealthDepartments/Pages/index.aspx). Forms used for reporting children’s blood lead levels and investigating cases an are listed in **Table 1**. Upload completed forms directly to the case inside Orpheus.

**Table 1. Lead Poisoning Forms for Children (< 18 years old)**

|  |  |  |
| --- | --- | --- |
| **Form Title** | **Reporting** | **Usage** |
| [*Elevated Blood Lead Reporting Form*](http://www.oregon.gov/oha/PH/HealthyEnvironments/HealthyNeighborhoods/LeadPoisoning/CountyHealthDepartments/Documents/EBLLReportingForm.pdf) | Report electronically via Orpheus or Fax | All cases with BLLs ≥ 3.5 μg/dL |
| [*Elevated Blood Lead Investigation Questionnaire*](http://public.health.oregon.gov/HealthyEnvironments/HealthyNeighborhoods/LeadPoisoning/CountyHealthDepartments/Documents/environmentalquestionnaire.pdf) | Upload in Orpheus | All confirmed BLLs ≥ 3.5 μg/dL |

**2. LEAD POISONING AND ITS EPIDEMIOLOGY**

**2.1 Background**

Lead is a naturally occurring soft metal found in rocks and soil. Throughout history, it has been used for a variety of purposes (e.g., glazing pottery, soldering). Characteristic features of lead toxicity, including anemia, colic, and coma, were noted by Hippocrates in ancient times.1 Lead serves no useful biologic purpose in the human body, and recent evidence demonstrates that multiple health effects can occur at lead levels once considered safe.2 The insidious nature of lead poisoning means that the only way to know if an adult or child has been exposed to lead is to perform a blood test. Lead poisoning continues to be an important environmental and occupational health problem. For more information on sources of lead exposure, see Section 8.

* 1. **Description of Illness**

1. **Absorption and Distribution**

Ingestion and inhalation are the typical routes of lead exposure. The most common source of lead exposure for children is ingestion of lead-containing dust. The rate of lead uptake is affected by an individual’s developmental stage, route of exposure, and nature of the lead compounds to which the individual is exposed. Nutritional status is also important; a healthy diet high in iron and calcium and low in fat may slow the rate of lead absorption.

Absorption depends on the form of the lead. Inhaled, airborne lead is almost totally absorbed, while ingested lead absorption rates may vary from 10% in adults to 50% in children and pregnant people. Lead is absorbed more efficiently from dust from sanded lead-based paint than from whole paint chips. The most dangerous exposure is to lead vapors (formed whenever lead is melted) or other respirable lead compounds. Absorbed lead is detectable in blood, soft tissue and bone. The half-life of lead varies from about a month in blood, 1-1.5 months in soft tissue, and about 25-30 years in bone.3

For the purposes of these guidelines, persons with BLLs at or above the BLRV are considered to have lead poisoning. Lead poisoning can affect both children and adults, although the effects may vary markedly with age. It is convenient, albeit somewhat artificial, to divide lead poisoning into an acute disease that relates to current BLLs, and a chronic disease that relates to the cumulative effects of body lead burden. In both cases, the most prominent signs and symptoms are neurological. Bear in mind that persons with very high BLLs (≥70 μg/dL in children, ≥100 μg/dL in adults) should be treated as medical emergencies, regardless of overt symptoms. Ingestion of a metallic object that may contain lead can result in an EBLL within hours. Ingestion of any object that may contain lead should be treated as a medical emergency and treatment should include a blood lead test, an abdominal x-ray, and bowel decontamination if needed.

1. **Acute Disease**

Acute exposure to lead generally means exposure for a short time, but at high levels. Blood lead levels increase quickly after an acute exposure. The most common symptom of acute lead poisoning is colicky abdominal pain evolving over days to weeks. Constipation, diarrhea, and nonspecific complaints of irritability, fatigue, weakness and muscle pain may also occur. These symptoms are seldom caused by BLLs less than 50 μg/dL. In more severe cases, warning signs of acute, serious brain swelling include vomiting, irritability, restlessness, tremors, and progressive drowsiness. These symptoms may herald the onset of seizures, coma, and possibly death. The BLLs associated with encephalopathy in children vary from study to study, but BLLs of 70-80 μg/dL or greater appear to indicate a serious risk.3

1. **Chronic Effects**

Chronic lead exposure generally means exposure to lead over a long period. Recent studies suggest that lead absorption is harmful at any concentration and that no safe level of lead exposure exists.2,4 Relatively low blood lead levels rarely cause overt signs and symptoms, but such exposure can cause permanent damage—especially in young children—including decreased IQ, developmental delays and behavioral disturbances. In adults, late effects of chronic lead toxicity include chronic renal failure, hypertension, gout, and chronic encephalopathy.5

**3. TESTING METHODS AND CASE DEFINITIONS**

.SE DEFINITIONS, DIAGNOSIS, ABORATORY SERVICE

**3.1 Testing Methods**

Blood lead testing is the only acceptable laboratory test for screening and confirming lead exposure. Venipuncture is preferred for specimen collection, but capillary testing is acceptable if care is taken to properly clean and prepare the finger. Capillary samples are easier to contaminate because of the possibility of lead containing dust and dirt on the hand or under the fingernails. All capillary BLLs of ≥ 3.5 μg/dL (children or pregnant people) or higher should be followed with a confirmatory venous test, however, follow-up capillary samples are acceptable if a venous draw cannot be performed. See section 4.6 below for additional guidance.

Several tests have been found to be insensitive and/or imprecise as screeningtests for lead and are not recommended. These include: erythrocyte protoporphyrin (EP) measured as either free erythrocyte protoporphyrin (FEP) or zinc protoporphyrin (ZPP); basophilic stippling; urine testing; and assays of hair or fingernail lead levels.

**3.2 Case Definitions**

In 1991, CDC defined BLLs of ≥ 10 μg/dL as the “level of concern” for children aged 1-5 years. Based on a growing body of studies of adverse health effects with BLLs less than 10 μg/dL, CDC changed the term “level of concern” to a “[blood lead reference value](https://www.cdc.gov/lead-prevention/php/data/blood-lead-surveillance.html" \l "cdc_data_description_what_the_data_includes-blood-lead-reference-value)” (BLRV), to reinforce that there is no recognized safe level of lead in blood. This level is based on the 97.5th percentile of the blood lead values among U.S. children ages 1-5 years from National Health and Nutrition Examination Survey (NHANES) cycles. Children with blood lead levels at or above the BLRV represent those at the top 2.5% with the highest blood lead levels. On May 13, 2012, CDC adopted the BLRV of ≥ 5 μg/dL. OHA adopted the reference value of ≥ 5 μg/dL in 2016. [On May 14, 2021](https://www.cdc.gov/nceh/lead/advisory/lepac-meeting-5-14-21.html) the Federal Lead Exposure and Prevention Advisory Committee (LEPAC) voted unanimously in favor of recommending that CDC update the reference value to 3.5 μg/dL based on these NHANES data.

LPHAs are expected to conduct case management activities for children and pregnant and lactating people according to the public health action levels listed in Table 2. LPHAs may request technical assistance from OHA in conducting case management activities as needed. OHA will provide and/or arrange periodic training to LPHA staff on case management procedures. The goal is to ensure that all children and pregnant and lactating people with a lead poisoning case receive the appropriate care and follow-up services needed to reduce the negative health outcomes associated with lead exposure.

**Table 2. Lead Poisoning Case Definitions**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Population** | | **Surveillance** | | **Reference Value/Case Definition** |
| Children (< 18 years old) | All BLLs | | ≥ 3.5μg/dL\* | |
| Pregnant and Lactating People | All BLLs | | ≥ 3.5 μg/dL\* | |
| Adults (≥ 18 years old) | ≥ 5 μg/dL | | ≥ 10 μg/dL\*\* | |

\*[Oregon Administrative Rule (OAR) 333-017-0000](https://secure.sos.state.or.us/oard/view.action?ruleNumber=333-017-0000): (6) “Blood lead level at or above the blood lead reference value” means a lead level, in at least one venous blood sample or in two capillary blood samples drawn within 12 weeks of each other, of at least 3.5 micrograms per deciliter.

\*\*LPHAs are not expected to conduct case management activities for adults (with the exception of pregnant and lactating people). OHA conducts investigations for adult cases and will alert LPHAs only when there is concern for the health of other household members.

**4. Screening schedules and medical management**

SCREENING SCHEDULES AND MEDICAL MANAGEMENT

**4.1 Overview**

The goal of lead screening is to identify individuals who have been exposed to lead, provide appropriate interventions and reduce the risk of future exposure. If an EBLL is detected, the nature of care and the frequency of follow-up testing vary with the patient’s age and BLL. Whatever the age, individuals with EBLLs (or their caregiver) should be educated about what lead poisoning is and what they can do about it. **The single most important factor in managing lead poisoning is identifying and reducing exposure to lead.** A variety of culturally-appropriate educational pamphlets are available; they should be sent to the family or individual identified as having an EBLL.

##### 4.2 Anticipatory Guidance

Anticipatory guidance regarding lead hazard identification and risk reduction measures should be a routine part of an ongoing educational approach for pregnant people, children and their families. Medical providers should provide source identification and risk reduction educational materials. There is no safe level of lead and the majority of children and adults in the U.S. have blood lead levels less than 2 μg/dL.6 Individuals should reduce lead exposure and maintain the lowest possible blood lead level.

Lead exposure during pregnancy is especially problematic as lead can cross the placenta and interfere with normal development of the fetal brain. Pregnant people can be exposed to lead through all of the sources described previously. Pregnant people or people likely to become pregnant should try to avoid exposure and maintain lead levels below 5 μg/dL and as low as possible. Anticipatory guidance should focus on decreasing the risk of exposure to lead by advising against activities such as remodeling or repainting the baby’s room or restoring old furniture. For people exposed occupationally, discuss personal protective equipment and consider contacting the employer to encourage reducing exposure. OHA can assist with occupational exposures.

**4.3 Screening Protocols for Children**

Children should be assessed for risk of lead exposure by administration of the Oregon Lead Risk Assessment Questionnaire (see below). This questionnaire should be administered at 1 and 2 years of age, or between 3 and 5 years of age if not previously screened. If the answer to any question is “Yes” or “Don’t know,” a blood lead test should be performed. Follow-up questions may be needed to clarify responses. Children who are enrolled in [Medicaid](https://www.medicaid.gov/federal-policy-guidance/downloads/cib113016.pdf) are required to blood lead screening tests at 12 and 24 months or between 3 and 5 years of age if not previously tested ([OAR 410-151-0040](https://secure.sos.state.or.us/oard/view.action;JSESSIONID_OARD=Vt6nSwEb7O1XAdlHrhhOnFOvxdqrhzsGYf08cKW--X8kau9B4lLZ!-579634964?ruleNumber=410-151-0040)).

* Has your child lived in or regularly visited a home, childcare or other building built before 1950?
* Has your child lived in or regularly visited a home, childcare or other building built before 1978 with recent or ongoing painting, repair and/or remodeling?
* Is your child enrolled in or attending a Head Start program?
* Does your child have a brother, sister, other relative, housemate or playmate with lead poisoning?
* Does your child spend time with anyone that has a job or hobby that may involve lead? *Examples: painting, remodeling, auto radiators, batteries, commercial recycling, auto repair, soldering, making sinkers, bullets, stained glass, pottery, going to shooting ranges, hunting or fishing.*
* Do you have pottery or ceramics made in other countries, or leaded crystal or pewter that are used for cooking, storing or serving food or drink?
* Has your child ever taken any traditional home remedies or used imported cosmetics? *Examples: Azarcon, Alarcon, Greta, Rueda, Pay-loo-ah, Surma, or Kohl*
* Has your child been adopted from, lived in or visited another country?
* Do you have concerns about your child’s development or behavior?
* Do you live near an automotive repair shop, recycling center, factory or manufacturing plant (for batteries, plumbing fixtures, ammunition, glass, paint and pigments), firing range, bridge or highway construction, or other industry likely to release lead?   
  *For more examples, see Table 5, Section 8.*

4.4 Screening Protocols for Pregnant and Lactating People

The purpose of screening pregnant people is to identify people exposed to lead who can benefit from the knowledge of their lead exposure and prevent additional exposure or adverse effects to themselves or their fetuses. Identifying maternal lead exposure prior to conception or early in the pregnancy offers the most benefit to the fetus. The following questionnaire should be administrated at the earliest contact with the patient. If the answer to any question is “Yes” or “Don’t know,” a blood lead test should be performed. Follow-up questions may be needed to clarify responses.

* Do you live in a house or apartment building built before 1978 with recent or ongoing remodeling, repairs or painting?
* Do you or anyone in your household have a job or hobby that may involve lead? *Examples: painting, remodeling, auto radiators, batteries, commercial recycling, auto repair, soldering, making sinkers, bullets, stained glass, pottery, going to shooting ranges, hunting or fishing.*
* Have you recently eaten or chewed crushed pottery, soil, paint chips, clay, or other things that are not food?
* Do you have pottery or ceramics made in other countries, or leaded crystal or pewter that are used for cooking, storing or serving food or drink?
* Have you recently taken any traditional home remedies or used imported cosmetics? *Examples: Azarcon, Alarcon, Greta, Rueda, Pay-loo-ah, Surma, or Kohl*
* Have you recently lived in or visited another country?
* Do you live near an automotive repair shop, recycling center, factory or manufacturing plant (for batteries, plumbing fixtures, ammunition, glass, paint and pigments), firing range, bridge or highway construction, or other industry likely to release lead?   
  *For more examples, see Table 5, Section 8.*

4.5 Diagnostic Blood Lead Testing

Blood lead testing should also be considered as part of a diagnostic work-up of any individual regardless of age with the following symptoms, issues, or living situations:

* + **Behavioral problems (applies to children):** aggression, hyperactivity, attention deficit, school problems, learning disabilities, excessive mouthing or pica behavior and other behavior disorders.
  + **Developmental problems (applies to children)**: growth, speech and language delays and/or hearing loss.
  + **Symptoms or signs consistent with lead poisoning:** irritability, headaches, vomiting, seizures or other neurological symptoms, anemia, loss of appetite, abdominal pain/cramping or constipation.
  + **Ingestion of foreign body.**
  + Proximity to airport: children who live near airports may be exposed to lead in air and soil from aviation gas used in piston engine aircraft.

4.6 Follow-up for Elevated Blood Lead Results

**A. Childhood Cases**

Any capillary BLL test result at or above 3.5 μg/dL should be confirmed with a venous sample. The higher the BLL on the capillary test, the more urgent the need for venous confirmatory testing. If repeated attempts to obtain a venous confirmatory sample are unsuccessful, a second capillary sample may be used to guide follow up actions to avoid significant delays in management. However, as capillary samples can yield frequent false positives, a venous confirmatory sample should still be pursued. Follow-up capillary tests performed on the same day with results at or above 3.5 μg/dL should still be confirmed with a venous draw or second capillary draw at a subsequent visit. This is due to the likelihood that the capillary specimen site on the fingertip may have not been cleaned correctly during the visit when the two samples were taken.

**Exception to confirmatory testing schedule:** If recent known exposure (e.g., foreign body ingestion, recent remodeling), confirm as soon as possible for all blood lead levels.

**Table 3** is to be used as guidance. Case managers and clinicians should consider individual patient characteristics and caregiver capabilities and adjust the frequency of follow-up tests accordingly.

**Table 3. Follow-up Schedule for Blood Lead Results in Children**

| **BLL**  **(μg/dL)** | **Confirmation Testing**  **(venous)** | **Follow-Up Testing**  **(venous)** | **Case Management**  **for BLLs in Children** |
| --- | --- | --- | --- |
| **3.5\*-9** | As soon as possible, or within 3 months | 3 months | **Clinician case management:**   * Perform confirmatory testing. Confirm recent known exposure as soon as possible. * Provide risk reduction education * Provide nutritional education and refer to WIC as needed. If WIC enrolled, notify local WIC program of EBLL for nutritional assessment. * Ensure follow-up testing by established timeframe. * Include history of blood lead levels in problem list of child’s permanent medical record. * See [CDC guidelines](https://www.cdc.gov/lead-prevention/hcp/clinical-guidance/index.html) for more medical management recommendations.   **LPHA case management:**   * Contact caregiver regarding child’s BLL. * Ensure case is confirmed with venous test **before** investigating, either with physician or parent/guardian. * Complete [*Elevated Blood Lead Investigation Questionnaire*](http://public.health.oregon.gov/HealthyEnvironments/HealthyNeighborhoods/LeadPoisoning/CountyHealthDepartments/Documents/environmentalquestionnaire.pdf)over phone to explore possible exposure sources. * Complete on-site investigation to identify lead hazards. Follow procedures outlined in Section 7, *Environmental Investigation Procedures*. If on-site investigation is not practical or feasible (as determined on a case-by-case basis), a phone interview using the [*Elevated Blood Lead Investigation Questionnaire*](http://public.health.oregon.gov/HealthyEnvironments/HealthyNeighborhoods/LeadPoisoning/CountyHealthDepartments/Documents/environmentalquestionnaire.pdf)may be acceptable. * Refer to housing remediation services (see pg. 18) if applicable and/or available. * Send environmental sampling results (and those performed by OHA) and follow-up recommendations in letter to family * Send copy of questionnaire and follow-up letter to clinician. * Refer family to WIC, social services, public assistance, Early Intervention or housing remediation services if applicable and/or available. * Ensure follow-up testing by established timeframe. |
| **10-19** | As soon as possible, or within 1 month | 3 months | **Clinician case management:** ALL OF THE ABOVE.  **LPHA case management:** ALL OF THE ABOVE.   * Coordinate with OHA to prioritize a home investigation to identify probable lead exposure sources. |
| **20-44** | As soon as possible, or within 2 weeks | 1 month | **Clinician case management:** ALL OF THE ABOVE, PLUS:   * Children with BLLs > 20 μg/dL should have a medical examination. * Conduct neurodevelopmental monitoring. * Consider abdominal X-rays and bowel decontamination if lead-based paint chips or radiopaque foreign bodies are present.   **LPHA case management:** ALL OF THE ABOVE. |
| **45-59** | As soon as possible, or within 48 hours | Chelation\*\* with subsequent follow-up. | **Clinician case management:** ALL OF THE ABOVE, PLUS:   * Chelation therapy. Follow-up testing schedule determined by medical provider.   **LPHA case management:** ALL OF THE ABOVE. |
| **60-69** | As soon as possible, or within 24 hours | Chelation\*\* with subsequent follow-up | **Clinician case management:** ALL OF THE ABOVE, PLUS:   * Chelation therapy. Follow-up testing schedule determined by medical provider.   **LPHA case management:** ALL OF THE ABOVE. |
| ≥ **70** | Immediately as an emergency lab test | Chelation\*\* with subsequent follow-up | **Clinician case management:** ALL OF THE ABOVE, PLUS:   * Hospitalize child for chelation therapy immediately. Follow-up testing schedule determined by medical provider. The child should not be permitted to return to any environment that would expose him/her to lead.   **LPHA case management:** ALL OF THE ABOVE. |

\*Capillary Presumptive cases with blood lead levels of 3.5-4.9 µg/dL will be managed by the Oregon Health Authority’s Childhood Lead Poisoning Prevention Program (CLPPP) unless notified by the LPHA that it can manage these cases. CLPPP case management includes contacting the family and/or medical provider with recommendations for follow-up confirmatory testing. If confirmed, either through a venous draw or second capillary draw within 12 weeks that is ≥ 3.5 µg/dL, CLPPP will notify the LPHA and change the Local Epi in Orpheus. At that time, the LPHA will be expected to follow up with case management and the investigation.

\*\*While chelation therapy is considered a mainstay in the medical management of children with BLLs ≥ 45 μg/dL, it should be used with caution. Unless the clinician is intimately familiar with treatment protocols, he/she should consult with an expert such as one of the following prior to using chelation agents:7,8

* Medical toxicologist
* Clinician experienced in treating children with elevated BLLs
* [Northwest Pediatric Environmental Specialty Health Unit (PESHU)](http://depts.washington.edu/pehsu/)
* Center with expertise in the management of lead chelation therapy. Clinicians may contact the [Oregon Poison Center](http://www.oregonpoison.org/) for the names of accessible experts.
* For additional guidance, review the [Recommended Actions Based on Blood Lead Level](https://www.cdc.gov/lead-prevention/hcp/clinical-guidance/index.html) website from the CDC

**C. Pregnant and Lactating People**

Any capillary BLL test result ≥ 3.5 μg/dL should be confirmed with a venous sample. The higher the BLL on the capillary test, the more urgent the need for venous confirmatory testing. **Exception to confirmatory testing schedule:** If recent known exposure (e.g., foreign body ingestion, recent remodeling), confirm as soon as possible for all blood lead levels.

**Table 4** is to be used as guidance. Case managers and clinicians should consider individual patient characteristics and caregiver capabilities and adjust the frequency of follow-up tests accordingly.See CDC’s *[Guidelines for the Identification and Management of Lead Exposure in Pregnant and Lactating Women](https://stacks.cdc.gov/view/cdc/147837)*for more recommendations.

**Table 4:** **Follow-up Schedule for Elevated Blood Lead Results in Pregnant and Lactating People**

| **BLL**  **(μg/dL)** | **Confirmation Testing**  **(venous)** | **Follow-Up Testing**  **(venous)** | **Case Management**  **for BLLs in Pregnant and Lactating People** |
| --- | --- | --- | --- |
| **3.5-9** | As soon as possible, or within 3 months | 1 month | **Clinician case management:**   * Perform confirmatory testing. Confirm recent known exposure as soon as possible. * Obtain a maternal BLL prior to delivery, or cord BLL at delivery. More frequent testing may be indicated based on risk factor history. * Provide risk reduction education and counsel on avoiding further exposure, including pica behavior. * Provide nutritional education and refer to WIC as needed. If WIC enrolled, notify local WIC program of EBLL for nutritional assessment. * Ensure follow-up testing by established timeframe. * Assess nutritional adequacy and counsel on eating a balanced diet with adequate iron and calcium intake, through either diet or supplementation or a combination of both.   **LPHA case management:**   * Contact patient confirming BLL. * Complete [*Elevated Blood Lead Investigation Questionnaire*](http://public.health.oregon.gov/HealthyEnvironments/HealthyNeighborhoods/LeadPoisoning/CountyHealthDepartments/Documents/environmentalquestionnaire.pdf)over phone to explore possible exposure sources. * Complete on-site investigation to identify lead hazards. Follow procedures outlined in Section 7, *Environmental Investigation Procedures*. If on-site investigation is not practical or feasible (as determined on a case-by-case basis), a phone interview using the [*Elevated Blood Lead Investigation Questionnaire*](http://public.health.oregon.gov/HealthyEnvironments/HealthyNeighborhoods/LeadPoisoning/CountyHealthDepartments/Documents/environmentalquestionnaire.pdf)may be acceptable. * Send environmental sampling results (and those performed by OHA) and follow-up recommendations in letter to family * Send copy of questionnaire to and follow-up letter to clinician. * Refer patient to WIC, social services, public assistance, early intervention or housing remediation services if applicable and/or available. * For lactating people, breastfeeding should be encouraged. * For occupationally exposed people, discuss personal protective equipment and refer to the [Oregon Occupational Public Health Program](http://www.oregon.gov/oha/PH/HEALTHYENVIRONMENTS/WORKPLACEHEALTH/Pages/index.aspx). * Ensure follow-up testing by established timeframe. |
| **10-14** | As soon as possible, or within 1 month | 1 month | **Clinician case management:** ALL OF THE ABOVE.  **LPHA case management:** ALL OF THE ABOVE, PLUS:   * Refer occupationally exposed people to occupational medicine specialist and remove from workplace lead exposure. |
| **15-24** | As soon as possible, or within 2 weeks | Within 1 month and then every 2-3 months. | **Clinician case management:** ALL OF THE ABOVE.  **LPHA case management:** ALL OF THE ABOVE. |
| **25-44** | As soon as possible, or within 7 days | Within 1-4 weeks and then every month | **Clinician case management:** ALL OF THE ABOVE, PLUS:   * For lactating people with BLLs <40, breastfeeding should be encouraged. * For lactating people with BLLs >40, lactation should be continued, but breast milk should be pumped and discarded until BLLs <40.   **LPHA case management:** ALL OF THE ABOVE. |
| **>45** | As soon as possible, or within 2 days | Within 24 hours and then at frequent intervals depending on clinical interventions and trend in BLLs. | **Clinician case management:** ALL OF THE ABOVE, PLUS:   * Consultation with a clinician experienced in the management of pregnant people with BLLs in this range is strongly advised. * Treat as high-risk pregnancy and consult with an expert in lead poisoning on chelation and other treatment decisions.   **LPHA case management:** ALL OF THE ABOVE. |

**C. Adult Cases**

LPHAs are not expected to conduct case management activities for adults (with the exception of pregnant and lactating people). OHA conducts investigations for adult cases and will alert LPHAs only when there is concern for the health of other household members.

**Table 5:** **Follow-up Schedule for Elevated Blood Lead Results in Adults**

|  |  |
| --- | --- |
| **BLL**  **(μg/dL)** | **OHA Case Management**  **for BLLs in Adults** |
| **5-9** | * Surveillance only. * No case management in this range unless associated with an exposure event that involves multiple individuals. * OHA will provide surveillance data to Oregon OSHA. |
| **10-24** | * OHA will contact individual via letter after receiving an initial, confirmed BLL in this range. Adult Lead Case Interview form and educational materials will be included with the letter. * If no contact information is available, then the ordering physician will be contacted by OHA. Contact information for the individual as well as information regarding occupation/employer will be requested. * OHA will provide surveillance data to Oregon OSHA. |
| **>=25** | ALL OF THE ABOVE, PLUS   * OHA will contact the ordering physician to obtain suspected source of exposure and determine whether other household members, especially children and pregnant and lactating people, may also be at risk of exposure. * If the exposure is related to the individual’s occupation and it is the initial test result in this range, then OHA will notify Oregon OSHA immediately following contact with patient or physician. |
| **>60** | * BLLs at this level should be considered urgent. * The Oregon Poison Center (1-800-222-1222) is a referral source for physicians requesting advice on treatment of adults. * The greatest concern with adult cases is determining the source of exposure and determining whether other individuals are at risk from the same lead source. |

**5. MANAGING SPECIAL SITUATIONS**

**5.1 Lead Exposure during Pregnancy or Breastfeeding**

Lead exposure during pregnancy is especially problematic since lead can cross the placenta and interfere with normal development of the fetal brain. High levels of lead during pregnancy can also cause miscarriage, stillbirth, low infant birth weight and premature delivery. Pregnant people can be exposed to lead through all of the sources described previously. Because lead is stored in bone, people who have worked or been exposed to lead in the past may have higher lead levels because lead can be released into the blood during pregnancy. Pregnant or people likely to become pregnant should try to avoid exposure and maintain lead levels below 5 μg/dL and as low as possible. Guidance for pregnant people should focus on proper nutrition, sources of lead exposure and ways to reduce exposure before and during pregnancy. Risk factors such as pica, poor nutrition, country of origin, immigrant status, hobbies and occupations should be discussed. People exposed occupationally may need special risk-reduction counseling and should be referred to Oregon OSHA or the Lead Poisoning Prevention Program. For more information on lead exposure during pregnancy and breastfeeding, see CDC’s [*Guidelines for the Identification and Management of Lead Exposure in Pregnant and Lactating Women*](http://www.cdc.gov/nceh/lead/publications/LeadandPregnancy2010.pdf)*.*

**5.2 Chelation Therapy**

Chelating agents solubilize lead, depleting it from soft and hard tissue and thereby reducing its acute toxicity. While chelation therapy is considered a mainstay in the medical management of children with BLLs >45 μg/dL, it should be used with caution. Treatment with chelating agents lowers BLLs, but does not improve scores on tests of cognition, behavior, or neuropsychological functions except in patients with extremely high BLLs. Primary care providers (PCP) should consult with the Oregon Poison Center prior to using chelating agents. In the short term, chelation can redistribute body lead, causing an increase in lead concentrations in soft tissue, including the brain. Some chelators may remove essential minerals, such as calcium, iron, zinc, copper and other trace minerals, as well as lead. There is general agreement that individuals with very high BLLs (in children > 45 µg/dL; in adult >100 µg/dL) should be chelated. Patients with lower BLLs (children <25 µg/dL; adults <65 µg/dL) are usually not chelated unless symptomatic and/or unresponsive after removal from exposure. For patients with in-between BLLs, chelation may or may not be appropriate.

**6. CASE CLOSURE (APPLIES TO CHILD CASES ONLY)**

**6.1 Laboratory Case Closure**

Child’s BLL has declined to below 3.5 μg/dL on two consecutive tests at least three months apart.

**6.2 Administrative Case Closure**

Child’s case is lost to follow-up. If child/family moves out of state, please notify the Lead Poisoning Prevention Program so they can notify the health department in the state where the child has relocated. The case may also be closed if the medical provider or family does not plan on further follow-up testing. There should be at least three documented attempts to contact the family, whether by phone or letters. If possible, the last attempt to reach the family should be through certified mail.

**7. Environmental Investigation Procedures**

**7.1 Environmental Investigation Procedures for Children Exposed to Lead**

* ***LPHA resource capacity for investigations****:* While LPHAs are expected to investigate each reported case of child lead exposure (OAR 333-019-0000), resource availability and staff experience should be considered. If assistance is needed, consult with OHA’s Childhood Lead Poisoning Prevention Program (CLPPP) for recommended next steps or support.
* ***Different types of investigations*:** Public health investigations include identifying the probable sources of lead exposure and carrying out appropriate control measures. Depending on the situation and other factors, such as age of child and age of the home, one or more types of investigations may need to occur to effectively identify and reduce further exposure to sources of lead:
  1. ***Phone interview:*** Most investigations should start here. A phone interview using the [Environmental Investigation Questionnaire](https://www.oregon.gov/oha/PH/HEALTHYENVIRONMENTS/HEALTHYNEIGHBORHOODS/LEADPOISONING/COUNTYHEALTHDEPARTMENTS/Documents/environmentalquestionnaire.pdf) will collect verbal information on the child’s home and family situation. The interview can also determine if environmental samples (paint, dust, soil, water, etc.) should be collected during a home environmental assessment, or if a lead risk assessment is warranted. In some cases, a phone interview could collect all necessary information without needing a follow-up investigation in the home. Situations where a phone interview could complete the investigation process includes: cases where the child is a newly-arrived refugee or immigrant, or recently spent significant time in another country where exposure may have occurred; cases living in homes built after 1985 with very clear source(s) of exposure, such as a recalled food or consumer product, or hobby/occupation where the adult(s) engaged in the activity have committed to behavior changes to reduce lead exposures; cases where children are 10 years or older and do not exhibit signs of pica or developmental concerns; or other situations on a case-by-case basis after consultation with CLPPP.
  2. ***Home visit:*** A home visit may be needed after completing the phone interview. These can be performed by any staff without the need of a risk assessor certification. The objective of this kind of investigation is to determine if environmental sampling is warranted by a certified risk assessor (in pre-1978 housing). Activities could include looking for deteriorated paint, visible dust, or bare soil, or identifying other potential sources of lead exposure for follow-up sampling. Additionally, a home visit can provide an opportunity for other samples to be taken onsite by any public health staff (i.e., no certification is required). The latter could include sampling water, consumer products (i.e., spices, cosmetics, toys, etc.), or dust, soil or paint in homes built after 1977.
  3. ***Environmental investigation:*** This type of investigation prioritizes environmental sampling to identify potential lead-based paint hazards in pre-1978 housing. An environmental investigation includes targeted testing and sampling of paint, dust and soil and the provision of a brief report identifying all sample results and follow-up mitigation strategies and recommended behavior or hygiene changes. This type of investigation can be performed by OHA or LPHA staff that are certified risk assessors.
  4. ***Lead Risk Assessment:*** Risk assessments will be completed by a third-party certified risk assessor and will include a significant number of environmental samples followed by a detailed report that includes descriptions of interim controls and/or abatement options for each identified lead-based paint hazard. Risk assessments will be contracted by OHA in situations where the child’s home exhibits a large amount of potential lead-based paint hazards and expertise is needed to identify effective mitigation or remediation strategies. These may also be conducted when the child’s pre-1978 home falls under Section 8 or public housing programs.
* ***Communicating with parent/guardian***: Determine language and literacy. If non-English speaking, arrange for an interpreter. Select appropriate educational materials based on language and reading level.
* ***Schedule Interview/Investigation***: Ask the parent/guardian when a good time for an interview would be and who will be present. Most small children have a regular schedule. Work with the family’s schedule.
* ***Phone Interview/Investigation:*** Fill out the *[Elevated Blood Lead Investigation Questionnaire](http://public.health.oregon.gov/HealthyEnvironments/HealthyNeighborhoods/LeadPoisoning/CountyHealthDepartments/Documents/environmentalquestionnaire.pdf)* or *[HUD EBL Investigation Questionnaire](https://www.hud.gov/sites/documents/2012FORM16_1_PDF.PDF)* and follow the guidelines listed in this section while conducting the investigation. The answers to the questions will help to determine the next steps in the investigation, which could include a home visit.
* ***Determine Age and Ownership of Housing***: Contact the county tax assessor’s office or visit their website to determine age of housing. Older housing (pre-1950) is more likely to have lead-based paint and a higher concentration of lead in the paint. Any pre-1978 housing is considered suspect for lead-based paint. If the rental home was built before 1978, also ask if the family receives [Section 8/housing choice voucher assistance](https://www.hud.gov/topics/housing_choice_voucher_program_section_8) or if the property is owned by an [Oregon public housing authority](https://www.housingauthoritiesoforegon.com/). HUD requires a response to these cases in accordance with the [Lead Safe Housing Rule](https://www.hudexchange.info/programs/lead-based-paint/lshr-toolkit/respond-to-a-child-with-an-ebll/). In these instances, contact OHA for more assistance.
* ***Visit the Home (if warranted)***:
  + - 1. ***Administer/Review Investigation Questionnaire*** Bring a copy of the [*Elevated Blood Lead Investigation Questionnaire*](http://public.health.oregon.gov/HealthyEnvironments/HealthyNeighborhoods/LeadPoisoning/CountyHealthDepartments/Documents/environmentalquestionnaire.pdf) *or [HUD EBL Investigation Questionnaire](https://www.hud.gov/sites/documents/2012FORM16_1_PDF.PDF)* you filled out during the phone interview and confirm the findings with parent/guardian and through visual assessment and sampling.
      2. ***Visual Assessment***: Use your inspection and observation skills to assess the environment to identify any potential lead exposure sources. A list of things to look for is included in the following section.

* + - 1. ***Note and follow up on all possible exposure sources***: Frequently there is more than one identifiable source. Do not jump to conclusions. Keep an open mind.
      2. ***Take environmental samples and/or test items suspected to contain lead***: Follow the instructions listed in Section 7.3.

**7.2 What to Look for During On-Site Investigations**

* + - * + **In Housing Built Before 1978:**
* Peeling, worn or deteriorated paint.
* Paint chips, paint dust, and any chalky residue found inside and outside the house.
* Dust in window troughs/wells, windowsills, and floors directly under windows.
* Friction or abrasion areas: windows, doors, cabinets, painted steps, etc.
* Recent remodeling activities: new surfaces, new windows, changes in floor plan, paint preparation, disturbing of paint.
* **In All Housing (obtain permission to check suspected items):**
* Worn or peeling paint found on furniture, toys or other household objects.
* [Vinyl mini-blinds](https://www.nmhealth.org/publication/view/marketing/2002/): older ones made before 1997 may still be a source of lead. Advise replacement of vinyl mini-blinds if these are not known to be lead-free.
* Painted or vinyl/plastic toys. Look at [toy recall list](https://www.cpsc.gov/Recalls).
* Teeth marks or other signs of chewing on objects or surfaces
* Imported, old or improperly glazed pottery or leaded crystal: Advise not to use for food preparation, cooking, serving or storage.
* Lead-containing objects: Items like pewter serving trays, statuary, toys, fishing weights, bullets, leaded glass, etc. Advise against playing with or handling these objects.
* Lead-related jobs and hobbies: Home remodeling and painting, battery and radiator work, car and boat repair, racing cars that use leaded fuel or avgas (“100LL”), and shooting sports and ammunition reloading are common sources of lead exposure. Advise family members to avoid “take-home” lead exposures by careful hygiene practices and changing contaminated clothes at work. Store and wash work/hobby clothes separately. Restrict child’s access to lead activity areas. Employer should check Safety Data Sheets. Visit this *page (placeholder)* or scan the following QR code to find a list of many jobs and hobbies that involve or work with lead or products that contain lead.
* Cultural medicines, home remedies and cosmetics: Look for home remedies or cosmetics that are stored in unmarked containers or have foreign labels. Expect adults to be reluctant to talk about home/cultural remedies. Colorful or bright powders, such as sindoor, Kumkum, [kohl/ surma](https://www.fda.gov/cosmetics/cosmetic-products/kohl-kajal-al-kahal-surma-tiro-tozali-or-kwalli-any-name-beware-lead-poisoning), Vibhuti ash, or [Azarcon/Greta](https://www.cdc.gov/mmwr/preview/mmwrhtml/00000164.htm), have been identified during investigations of Oregon lead exposure cases. Check this [EPA site](https://www.epa.gov/children/heavy-metals-cultural-products) for additional guidance and fact sheets in multiple languages.
* Colorful [spices](https://www.cdc.gov/mmwr/volumes/67/wr/mm6746a2.htm) from other countries. [Turmeric](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5415259/), chili powder, curry, saffron, and [cinnamon](https://www.fda.gov/food/alerts-advisories-safety-information/more-ground-cinnamon-products-added-fda-public-health-alert-due-presence-elevated-levels-lead) have all been identified as containing lead.
* Drinking water components or plumbing containing lead pipe or solder with copper piping: Recommend that family run water for 30 seconds (or until cold) before use. Advise against using hot tap water for drinking, cooking and especially mixing baby food or formula. Recommend frequent aerator cleaning and use of certified water filters.
* Other items in the yard or storage that might contain lead: Old boards, other painted building materials or old batteries, [fishing gear](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6675807/), lead ingots, and [lead-sheathed telephone cables](https://ehsc.oregonstate.edu/our-research/research-highlights/lead-sheathed-telephone-cables).
* Proximity to airports: [EPA’s endangerment finding](https://www.epa.gov/regulations-emissions-vehicles-and-engines/regulations-lead-emissions-aircraft" \l ":~:text=The%20EPA%20has%20issued%20a,are%20primarily%20piston%2Dengine%20aircraft.) identified areas up to 1 km from airports with piston engine aircraft that could create leaded fuel emissions that endanger public health.

**7.3 Testing Items and Collecting Samples**

Use an [EPA-recognized lead test kit](https://www.epa.gov/lead/lead-test-kits) or X-ray fluorescence analyzer (XRF) during lead exposure investigations to determine the presence of lead on suspected surfaces and items. When using test kits, follow the manufacturer’s instructions.

Sampling paint, dust, or soil for lead contamination in homes built after 1977 does not require a risk assessor certification. Still use the sampling protocols found in the [2012 HUD Guidelines for the Evaluation and Control of Lead-Based Paint Hazards in Housing](https://www.hud.gov/program_offices/healthy_homes/lbp/hudguidelines):

* [Chapter 5: Risk Assessment and Reevaluation](https://www.hud.gov/sites/documents/CH05_12-13-12.PDF)
* [Appendix 13.1: Wipe Sampling of Settled Dust for Lead Determination](https://www.hud.gov/sites/documents/LBPH-40.PDF)
* Appendix 13.2: [Paint Chip Sampling](https://www.hud.gov/sites/documents/LBPH-41.PDF) (destructive sampling is discouraged and other sampling/testing options should be prioritized)
* [Appendix 13.3: Collecting Soil Samples for Lead Determination](https://www.hud.gov/sites/documents/LBPH-42.PDF)
* **Testing with [EPA-Recognized Lead Test Kits](https://www.epa.gov/lead/lead-test-kits) or XRF by [Certified Risk Assessors](https://www.ecfr.gov/current/title-40/part-745" \l "p-745.223(Certified%20risk%20assessor)):**
* Paint: Identify paint in a deteriorated condition in a pre-1978 home by visually assessing the interior and exterior. These surfaces and components should be tested if the child has access to them, or if they could cause exposure to lead-contaminated dust. Advise “lead-safe” repair or removal of all paint in poor condition, as well as the repair of any condition that causes peeling paint, leaks, poor ventilation, etc. Information on “lead-safe” remodeling is available at 971-673-0440 or [www.healthoregon.org/lead](http://www.healthoregon.org/lead).
* Blinds: Test older (pre-1997), vinyl mini-blinds, as they may still be a source of lead.
* Toys: Test painted or vinyl/plastic toys as needed. The presence of lead near the [regulatory limits](https://www.cpsc.gov/Business--Manufacturing/Business-Education/Lead/Lead-in-Paint) set by the US Consumer Product Safety Commission should warrant removal from the home. Since nearly all toys contain some quantity of lead, chewing and swallowing pieces or parts of toys, especially painted toys or those made from malleable plastics, could cause lead exposure.
* [Pottery](https://www.fda.gov/food/environmental-contaminants-food/questions-and-answers-lead-glazed-traditional-pottery) and crystal: Test imported, old or improperly glazed pottery, or crystal items used for drinking, food preparation or serving food. In the absence of testing, recommend against using these items for these purposes out of an abundance of caution.
* **Interior Environmental Samples:**
* Water: Recommend water samples only when there is reason to suspect lead such as in well water, lead-soldered plumbing, and/or brass fixtures installed before 2014. Homes built or plumbed between 1970-85 are at highest risk for lead-containing plumbing components.
  + Sampling water, even in pre-1978 housing, does not need risk assessor certification. Coordinate lab testing with OHA, or use an ORELAP-accredited lab for analysis: <https://orelap.state.or.us/searchLabs>
* Medicines and cosmetics: Take samples if appropriate. Recommend against using these medications until samples are found to be lead-free. Use labs with FDA-approved methods that use inductively coupled plasma mass spectrometry (ICP-MS) or consult with OHA.
* Dust Samples from pre-1978 homes and child care facilities can only be taken by Certified Risk Assessors. Contact OHA for lead dust test kits that can be used by the parent or guardian.
* **Exterior Environmental Samples:**
* Soil samples from pre-1978 homes and child care facilities can only be taken by a Certified Lead Risk Assessor. Contact OHA for assistance.
* Check exposed soil and dirt areas, especially where children and pets play. Note location of all play and bare soil areas, as well as bare areas along the dripline of the house and near roadways.
* Discuss with the certified risk assessor or OHA recommendations for mitigation of any areas of bare soil that contain elevated or hazardous levels of lead.
* Other items: Old boards and furniture, other painted building materials, fishing equipment, bullets/ammunition or old batteries. Take note of these areas and advise removal of suspect objects.
* All paint chip, soil, and dust-wipe samples taken in pre-1978 housing or child-occupied facilities by LPHA certified risk assessors must be sent to labs accredited under the National Lead Laboratory Accreditation Program (NLLAP): https://www.epa.gov/lead/national-lead-laboratory-accreditation-program-list
  1. Refer to the resources below to provide families with lead reduction strategies. Language can be used from these resources to include in your report to the family. Only certified risk assessors should include lead-based paint hazard control or abatement recommendations, but any public health staff can use these resources for guidance:
     1. [HUD Guidelines: Interim Controls](https://www.hud.gov/sites/documents/LBPH-13.PDF) (for paint, dust, or soil-lead hazards)
     2. [HUD Guidelines: Cleaning](https://www.hud.gov/sites/documents/LBPH-16.PDF)
     3. [EPA: Steps to Lead Safe Renovation, Repair and Painting](https://www.epa.gov/lead/steps-lead-safe-renovation-repair-and-painting)
     4. [EPA: Actions to Reduce Potential Lead Exposure](https://www.epa.gov/lead/actions-reduce-potential-lead-exposure)
     5. [EPA: Protect Your Family from Sources of Lead](https://www.epa.gov/lead/protect-your-family-sources-lead)
     6. [CDC: Preventing Childhood Lead Poisoning](https://www.cdc.gov/lead-prevention/prevention/index.html)
* any smedical provider
* Provide guidance and referrals to recommended services that may be available to the family and make updates to these referrals in the Investigation/Followup tab in Orpheus. These include, but are not limited to:
  1. [Oregon WIC](https://www.oregon.gov/oha/ph/healthypeoplefamilies/wic/pages/index.aspx)
  2. [Early Intervention/Early Childhood Special Education](https://www.oregon.gov/ode/students-and-family/SpecialEducation/earlyintervention/Pages/default.aspx)
  3. [Public Health Home Visiting](https://www.oregon.gov/oha/ph/healthypeoplefamilies/babies/homevisiting/pages/index.aspx)
  4. Housing remediation services (i.e., [Community Action Agencies](https://caporegon.org/), home repair/renovation loan programs, [Habitat for Humanity](https://habitatoregon.org/), etc.)
  5. [CCO Health-Related Services](https://www.oregon.gov/oha/hpa/dsi-tc/pages/health-related-services.aspx)

**7.4 Comprehensive Lead Investigation Reimbursement**

Per OAR 410-151-0040, all children, pregnant and lactating women enrolled in the Oregon Health Plan with lead poisoning (confirmed BLLs ≥ 3.5 µg/dL) are eligible to receive follow up case management services. This OAR allows for reimbursement to LPHAs for the home investigation and any follow-up case management services. To bill for this reimbursement, HCPCS code T1029 must be used, along with Provider type 47 (“clinic”). This provider type is used for a variety of provided services that could be performed by an LPHA. The reimbursement is payable by the child’s CCO. If the LPHA does not have a contract with the CCO, contact the CCO first to get authorization for this service prior to sending the claim to the CCO. For additional guidance on this process, see this recorded webinar (*link placeholder for 10/23/2024 webinar*).

**8. Sources of Lead Exposure**

##### This list is not exhaustive but should be seen as general guidance for identifying the most common sources of lead exposure in Oregon. Check [OHA’s Lead Poisoning Prevention Program website](https://www.oregon.gov/oha/PH/HEALTHYENVIRONMENTS/HEALTHYNEIGHBORHOODS/LEADPOISONING/Pages/index.aspx) for news and links to new and emerging sources of lead exposure.

##### Paint

Lead was used in common house paint until 1978 when the Consumer Product Safety Commission (CPSC) restricted the amount of lead in household paint. Manybuildings built before 1978 have lead-based paint both inside and outside. Housing built before 1950 is at even greater risk of having lead-based paint and will typically have a higher concentration of lead in the paint. Lead paint in good condition poses little risk. Chipping, peeling or chalking lead paint is a common source of ingestible lead dust and may be a hazard.

Lead paint is still sold internationally. Painted toys from international sources may contain lead. Hobby and industrial paint may also contain lead.

1. **Dust**

Lead paint dust is the most common source of lead exposure for children. Lead in this form is much more easily absorbed. Interior house dust can become contaminated with lead as the result of the deterioration or disturbance of leaded paint, the tracking in of contaminated soil, and the fallout of airborne lead particulate from industrial or vehicular sources. Fine lead dust, and resulting contamination, can be created when painted surfaces rub against each other, such as where double hung windows slide up and down or when doors open and close. Lead in dust is increased after older paint has been disturbed through remodeling, renovation, paint preparation or repair.

1. **Occupational Exposures and “Secondary Transmission”**

While lead poisoning is not a communicable disease per se, household contacts of persons with occupational, vocational, or other exposures may risk secondary transmission of lead dust or other compounds brought home. Many industries and occupations can expose a worker to lead (Table 5). Some of the occupations that carry a potential for exposure to lead include remodeling/renovation, painting, building demolition, construction, battery manufacturing and recycling, radiator repair, and bridge construction. Individuals who work in a lead environment may bring lead dust into their car or home on their clothes and bodies, unintentionally exposing family members. Observation of good hygiene practices is important to avoid bringing lead dust into the home from the work place. These include washing or showering and changing out of work clothes/shoes before leaving for home or entering a vehicle.

If you suspect lead cross-contamination from an occupational source, consult with the OHA Childhood Lead Poisoning Prevention Program (CLPPP) about a potential OR-OSHA referral.

1. **Hobby Sources**

Many hobbies use lead (e.g., making or handling lead shot/bullets, fishing weights/sinkers, toy soldiers, stained glass solder, ceramic glazing, etc.). Heating and melting lead is particularly dangerous because of the formation of lead vapor, so respirator use and adequate ventilation are essential to prevent exposure. Other hobbies that carry a potential for exposure to lead include home remodeling and painting, furniture refinishing, welding, auto or boat repair, racecar driving (if using leaded fuel) and target shooting at firing ranges. Hobbyists can protect their families by keeping the hobby activity away from living areas and by showering or changing clothes/shoes before entering the home.

1. **Folk Medicines and Cosmetics**

Lead has been found in some traditional (folk or home remedies) medicines used by East Indian, Indian, Middle Eastern, West Asian, and Hispanic cultures. Lead and other heavy metals are put into certain folk medicines intentionally because these metals are thought to be useful in treating some ailments. Sometimes lead accidentally gets into the folk medicine during grinding, coloring, or other methods of preparation. Medications such as *greta, alarcon, rueda* and *azarcon*, used in the Latinx community for stomach ailments (*empacho*), or “pay*-loo-ah,*” similarly used by many Southeast Asians, may be as much as 90% lead by weight. Cosmetic products are a primary source of lead in Asian and Arab countries. Application of kohl or surma results in lead exposure primarily via hand-to-eye-to-mouth movement and subsequent ingestion of particles.

1. **Tableware**

Imported, old, handmade, or poorly glazed ceramic dishes and pottery may contain lead. Lead may additionally be present in leaded crystal, pewter and brass dishware. In these pieces, acid substances may interact chemically with the glaze and accelerate lead release. Therefore, acidic foods (such as orange, tomato and other fruit juices, tomato sauces, wines, and vinegar) stored in improperly glazed containers are potentially the most dangerous. If it is unknown whether a particular tableware item contains lead, the item should not be used to store, cook or serve food or beverages.

##### Water

Most well or city water does not naturally contain lead. Lead in drinking water is an infrequent source of lead poisoning in Oregon. Lead leaches into drinking water from brass faucets, lead solder that connects the pipes, or lead pipes. Hot water is particularly corrosive and should not be used for drinking, cooking, or preparing infant formula. Before any water is consumed, the cold-water tap should be flushed for 30 seconds to two minutes each morning, or after sitting for more than six hours, until there is a noticeable change in temperature of the water.

1. **Soil**

Soil may contain lead from deteriorating, exterior lead-based paint or deposition from years of leaded gasoline use or industrial emissions. Lead-contaminated soil can be tracked into the home. Children may be exposed to lead by playing in bare soil or from the soil on vegetables planted in a garden. In addition, individuals with pica may eat lead-contaminated soil. Covering bare dirt with grass or bark dust can effectively mitigate lead hazards unless soil lead levels are extremely high. Soil-lead hazards, as defined by EPA, are 400 ppm for play areas or an average of 1,200 ppm of bare soil in the rest of yard. EPA recommends fully abating soil at 5,000 ppm (this can only be prescribed by a certified risk assessor).

1. **Miscellaneous Sources**

Use of lead solder in the processing of canned foods in the United States has been discontinued; therefore, lead in food has been dramatically reduced. Imported food products may still contain lead as some foreign manufacturers may use lead solder in cans. Food may also be contaminated with lead from the soil during the growing process. Lead has been found in some consumer candies imported from Mexico. Certain candy ingredients such as chili powder and tamarind may be a source of lead exposure. Lead sometimes gets into the candy when processes such as drying, storing, and grinding the ingredients are done improperly. Additionally, lead has been found in the wrappers of some imported candies. The ink of these plastic or paper wrappers may contain lead that leaches into the candy. Lead has also been found in *chapulines*, dried grasshoppers often imported from Oaxaca, Mexico and prepared in traditional pottery with leaded glazes. Turmeric, a popular spice with purported health qualities, may be contaminated when lead chromate is added to the raw roots to hide pest damage and spots.

There continues to be an ever-increasing array of household products that contain lead, especially imported products. In recent years, lead has been found in vinyl mini-blinds, curtain weights, calcium supplements, hair dyes, crayons, and children’s jewelry and toys. Ingestion of any object that may contain lead should be treated as a medical emergency and treatment should include a blood lead test and abdominal x-ray (if BLLs are ≥ 20 µg/dL).

Additional information on sources of lead exposure is available on the OHA [Lead Program website](https://public.health.oregon.gov/HealthyEnvironments/HealthyNeighborhoods/LeadPoisoning/ParentsFamilies/Pages/sourcesoflead.aspx).

**Table 5A: Lead-related industries. Alarcon WA. Elevated Blood Lead Levels Among Employed Adults — United States, 1994–2013.** 9

|  |  |
| --- | --- |
| Industry Description | North American Industry Classification System (NAICS) |
| Storage battery manufacturing | 33591 |
| Alumina and aluminum production and processing | 33131 |
| Nonferrous metal (except copper and aluminum) rolling, drawing, extruding, and alloying | 33149 |
| Painting and wall covering contractors | 23832 |
| Highway, street, and bridge construction | 23731 |
| Residential building construction | 23611 |
| Remediation services | 56291 |
| Amusement and recreation industries | 71399 |
| Automotive, mechanical, and electrical repair and maintenance | 81111 |
| Fitness and recreational sports centers | 71394 |
| Copper, nickel, lead, and zinc mining | 21223 |

**Table 5B: Lead-related Occupations.** 10

|  |  |
| --- | --- |
| Occupation | Source of Exposure |
| Artists | Materials used may contain lead |
| Auto repairers | Car parts may contain lead |
| Battery manufacturers | Batteries contain lead |
| Bridge reconstruction workers | Old paint may contain lead |
| Construction workers | Materials used may include lead |
| Firing range instructors and gunsmiths | Ammunition contains lead |
| Glass manufacturers | Lead may be used in glass production |
| Lead manufacturers, miners, refiners and smelters |  |
| Manufacturers of bullets, ceramics, and electrical components | All products may contain lead |
| Painters | Old paint and commercial paint may contain lead |
| Plastic manufacturers | Materials made may contain lead |
| Plumbers and pipe fitters | Pipes may contain lead |
| Police officers | Ammunition contains lead |
| Radiator repairers | Radiators may contain lead |
| Recyclers of metal, electronics, and batteries | May contain lead |
| Rubber product manufacturers | Process contains lead |
| Shipbuilders | Materials used may include lead |
| Solid waste incinerator operators | Waste may contain lead |
| Steel welder | Galvanized steel is coated in part with lead |

**LANGUAGE CONVENTIONS**

Throughout these guidelines, terms used to describe a case are used interchangeably. These include: lead poisoning; elevated blood lead level (EBLL); lead exposure; and a blood lead level at or above the blood lead reference value.

In November 2022, the CDC released the document “[CDC’s Recommended Terminology When Discussing Children’s Blood Lead Levels](https://stacks.cdc.gov/view/cdc/122750)”. This document was released after the Council of State and Territorial Epidemiologists (CSTE) updated their position statement for lead, which changed the name of the condition under surveillance from “elevated blood lead level” to “lead in blood”. Both of these changes were made in an effort to recognize the fact that no safe level of lead in children’s blood has been identified. In October 2023, OHA amended OAR 333-017 to remove “lead poisoning” and change the condition to a “blood lead level at or above the blood lead reference value” to align with CDC’s recommendations.

Using older terminology in communications with the public or medical providers should not be discouraged since newer naming conventions may be unfamiliar or contain jargon that is confusing. While OHA concurs that no safe level of lead in children’s blood exists, the continued use of the term “lead poisoning” by CDC and other states demonstrates that the term is still useful in identifying the condition.

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**RESOURCES**

* Oregon Lead Poisoning Prevention Program: [www.healthoregon.org/lead](http://www.healthoregon.org/lead)
* CDC Guidelines for Identification and Management of Lead Exposure: [www.cdc.gov/nceh/lead](http://www.cdc.gov/nceh/lead)
* Northwest Pediatric Environmental Health Specialty Unit (PEHSU) for written guidance and clinician consultation: <http://depts.washington.edu/pehsu/index> or 1-877-KID-CHEM.
* CDC Guidelines for the Identification and Management of Lead Exposure in Pregnant and Lactating Women: <http://www.cdc.gov/nceh/lead/publications/leadandpregnancy2010.pdf>

**UPDATE LOG**

July 2011: Updated to reflect Oregon Health Authority. Updated to reflect change in adult surveillance case definition.

June 2013: Updated to reflect new CDC guidance on childhood lead reference value. Updated with additional information from CDC’s guidance for lead exposure in pregnant and lactating women.

May 2016: Updated to reflect Oregon Health Authority adoption of CDC childhood lead reference value and public health action level. Updated to reflect case management guidelines for children and pregnant and lactating women.

February 2018: Updated to reflect change in adult surveillance and case definition. Updated CDC list of lead-related industries and occupations Tables 6A and 6B.

October 2018: Updated to reflect changes in environmental sampling protocols and communication of case management records.

November 2023: Updated to reflect changes in the case definition, the CDC blood lead reference value, environmental sampling methods for pre-1978 housing, and replaced LeadCheck swabs with EPA-recognized test kits. Changed instances of pregnant “women” to pregnant “people”.