

## Lead Toxicity Overview

- **There is NO safe level of lead in the blood of a child.**
- Exposure to lead can seriously harm a child's health and cause well-documented adverse effects such as:
  - Damage to the brain and nervous system
  - Slowed growth and development
  - Learning and behavior problems and underperformance in school
  - Lower IQ and decreased ability to pay attention
  - Hearing and speech problems
- Lead is particularly dangerous because once in a person's system, it is distributed throughout the body, causing harm wherever it lands. In the bloodstream, it can damage red blood cells and limit their ability to carry oxygen to organs and tissues, causing anemia. Most lead ends up in the bone where it interferes with the production of red blood cells and the absorption of calcium. The effects of long-term lead toxicity include damage to the nervous system, kidneys, and hearing, poor muscle coordination, and decreased bone and muscle growth.
- **The American Academy of Pediatrics recommends:**
  - Physicians continue to provide anticipatory guidance to parents in an effort to prevent lead exposure
  - Pediatricians should increase their efforts to assess children at risk for lead exposure to find those with elevated blood lead levels (EBLLs)
- **Populations at higher risk of lead exposure include:**
  - Children from low-income households
  - Immigrant and refugee children from less developed countries
  - Some African American children, and those from other races and ethnicities, due to poor housing stock
  - Those living in housing built before 1978
  - Children younger than age 6 (hand to mouth activity)

However, children from all races, ethnicities and socioeconomic backgrounds can be at risk of exposure.

- All homes built prior to 1978 have a risk for lead exposure, but homes built before 1950 carry a greater risk due to a higher amount of lead used in paint before that time. Age and condition of housing, **not geographic location**, are the **best predictors** for the presence of hazards related to lead-based paint. Besides lead-based paint, secondary sources of lead continue to emerge (e.g., children's jewelry, imported herbal supplements, cosmetics, and food products) and are not limited to high-risk populations.

## Indiana Lead Testing Requirements

- **Universal Screening (Testing):** Beginning in 2022, Indiana statute was enacted requiring health care providers to confirm that children under seven (7) have been tested for lead, and if not, to offer this testing to the parent or guardian of that child. Children should receive a blood lead test between the ages of nine (9) and fifteen (15) months, or as close as reasonably possible, and again between twenty-one (21) and twenty-seven (27) months of age, or as close as reasonably possible. Any child between twenty-eight (28) and seventy-two (72) months with no record of a previous blood lead test must have one as soon as possible.
- **Medicaid Recipient Testing:** Indiana Medicaid requires all children be tested for lead according to the latest [EPSDT schedule](#). Currently, the required testing intervals match with the Universal Screening periodicity outline in the bullet above.
- **Refugee Infants and Children Testing:** All refugee infants and children up to age 16, particularly refugee and internationally adopted children, should be evaluated with a blood test for lead exposure at the domestic medical screening visit. Repeat blood lead testing for all refugee infants and children  $\geq 6$  years of age, regardless of initial screening BLL results is to be done within 3-6 months after initial testing.

## Verbal Risk Assessment:

The **Verbal Risk Assessment** helps health care providers assess a child's potential level of risk of exposure to lead hazards. It also provides health care providers an opportunity to educate families about lead hazards. **If the answer to any question on the Verbal Risk Assessment is "Yes" or "I don't know,"** then:

- Test the child for lead toxicity at that time
- Test the child at least annually or if any other risk factor exists. Continue to test until the child turns 6 years old or responses to the assessment change.
- Provide lead toxicity prevention education

**\* Completion of the assessment does not meet the Medicaid testing requirement.**

In the past year, has your child lived in, near, or regularly visited:	Yes	No	I don't know
A house built before 1978 that has peeling, chipping, or flaking paint?			
A house built before 1978 that has been remodeled within the past 6 months?			
A sibling, cousin, or friend who has been diagnosed or treated for lead toxicity?			
A factory or industrial plant or mine?			
Mexico, India, Middle East, Central America, South America, Africa, or Asia?			
In the past year, has your child been around adults who:	Yes	No	I don't know
Have a job that causes them to have frequent contact with lead (e.g. plumbers, construction, auto repair, metal/battery recycling, welders)?			
Have a hobby that causes them to have frequent contact with lead (e.g. hunt, fish, reload bullets, refinish furniture, work with stained glass, jewelry making)?			
In the past year, has your child consumed:	Yes	No	I don't know
Food or beverages from ceramic cookware/dishware or imported pottery?			
Food or candy with spices imported or brought in from another country (such as turmeric)?			
Ayurvedic medicines or home remedies (such as Azarcon, Greta)?			
Dirt or non-food items regularly (more than the typical baby mouthing behavior)?			
Cosmetics imported or brought from another country (such as Thanaka, Kohl)?			

## General medical evaluation and testing recommendations:

- Perform routine physical and history and developmental assessment. Evaluate achievement of, or regression from, milestones, particularly in psychosocial and language domains
- Assess nutrition and risk for iron deficiency.
- Evaluate for lead exposure risks.
- Initial test may be a capillary or venous test. Children with identified risk factors should be retested with a venous sample.

## General clinical management recommendations:

- Report **ALL** the blood lead test results to IDOH.
- Discuss test results with family and counsel on any identified risk factors.
- Provide prevention education (i.e., lead sources, reducing/eliminating strategies, health education, etc.)
- Counsel on nutrition and healthy eating, focusing on iron, calcium, and Vitamin C intake.
- Communicate patient management information with local health department.
- Consider referral to Supplemental Nutrition Program for Women, Infants, and Children.

Medical Evaluation and Testing Recommendations	Clinical Management
<b>BLL &lt; 3.5 µg/dL</b>	
<p><b>General medical evaluation &amp; testing recommendations (given above)</b></p> <p><b>Who to test?</b></p> <ul style="list-style-type: none"> <li>• All Indiana children between the ages of nine (9) and fifteen (15) months, or as close as reasonably possible, and again between twenty-one (21) and twenty-seven (27) months of age, or as close as reasonably possible. Any child between twenty-eight (28) and seventy-two (72) months with no record of a previous blood lead test must have one as soon as possible.</li> <li>• Medicaid recipients at 12 and 24 months, or any time before 6 years old if not previously screened.</li> <li>• Children in homes built before 1978 or with other <a href="#">risk factors</a></li> <li>• Children at the request of their parents/guardians.</li> </ul>	<p><b>Monitor BLLs:</b></p> <ul style="list-style-type: none"> <li>• Retest of BLL to be done no later than 12 months.</li> </ul> <p><b>General clinical management recommendations (given above)</b></p> <ul style="list-style-type: none"> <li>• When reviewing lab results with family, for reference, the geometric mean blood lead level for children 1-5 years old is less than 2 µg/dL.</li> </ul> <p><b>Chelation is NOT recommended in this blood lead level range.</b></p>
<b>BLL 3.5-4.9 µg/dL</b>	
<p><b>General medical evaluation &amp; testing recommendations (given above), PLUS:</b></p> <ul style="list-style-type: none"> <li>• Note the child's environmental history. Identify potential sources of exposure and provide preliminary advice on reducing/eliminating them.</li> <li>• Ensure iron sufficiency with laboratory testing and treatment per <a href="#">Pediatric Environmental Health Specialty Unit (PEHSU) and American Academy of Pediatrics guidelines</a>.</li> <li>• Perform structured developmental screening evaluations at periodic health visits to ensure appropriate developmental milestones are being met per <a href="#">AAP guidelines</a>, as lead effects may manifest over years.</li> <li>• Evaluate risk to household contacts such as siblings and pregnant/lactating women in the home.</li> </ul> <p><b>Monitor BLLs:</b></p> <ul style="list-style-type: none"> <li>• Confirmatory BLL draw within 3 months of original, may be done within shorter time period to ensure blood lead level is not rising. Venous test preferred, capillary acceptable</li> <li>• Retest of BLLs, done within 3 to 6 months.</li> <li>• If retest result is in another range, follow up as for that range.</li> </ul>	<ul style="list-style-type: none"> <li>• If BLLs are stable or decreasing, monitor initially with venous BLLs every 3 months and thereafter based on venous BLL trend. If retest result is in another range, follow-up or retest as for that range.</li> <li>• Children with prior exposure to lead may continue to have EBLLs. Providers should continue to monitor these children with follow-up testing at less frequent intervals than the usual recommendation.</li> </ul> <p><b>General clinical management recommendations (given above), PLUS:</b></p> <ul style="list-style-type: none"> <li>• Assess the child's environmental risk factors, eating habits, housing, and family's social service needs.</li> <li>• Test for iron sufficiency. Consider starting a multivitamin tablet with iron.</li> <li>• Test siblings, other children &lt;7 years old, and household contacts, especially pregnant and lactating women</li> <li>• Include primary/secondary residence and childcare facility as part of the investigation.</li> </ul> <p><b>Chelation is NOT recommended in this BLL range.</b></p>

## BLL 5-19.9 µg/dL

### General medical evaluation & testing recommendations (given above), PLUS:

- Note the child's environmental history. Identify potential sources of exposure and provide preliminary advice on reducing/eliminating them.
- Ensure iron and calcium sufficiency with laboratory testing and treatment per [Pediatric Environmental Health Specialty Unit \(PEHSU\)](#) and [American Academy of Pediatrics guidelines](#).
- Perform structured developmental screening evaluations at periodic health visits as lead effects may manifest over years.
- Evaluate risk to household contacts such as siblings and pregnant/lactating women in the home.

### Monitor BLLs:

- Confirmatory BLL draw within 1-3 months of original. Venous test preferred, capillary acceptable
- Retest thereafter within 3 months until BLL declines
- If retest result is in another range, follow up as for that range.
- If BLLs are stable or decreasing, monitor initially with venous BLLs based on venous BLL trend. If retest result is in another range, follow-up or retest as for that range.

### General clinical management recommendations (given above), PLUS:

- Assess the child's environmental risk factors, eating habits, housing, and family's social service needs.
- If a past exposure is noted, perform developmental screenings at periodic health visits (see above). Health effects of lead manifest over time.
- Test for iron sufficiency. Consider starting a multivitamin tablet with iron.
- Test siblings, other children <7 years old, and household contacts, especially pregnant and lactating women
- Make referrals to the local social services and assistance (WIC, Head Start, First Steps, Help Me Grow, etc.) if necessary.
- Include primary/secondary residence and childcare facility as part of the investigation.
- An environmental investigation and recommendations for remediation services and a home visit (education/referrals) by local health department (LHD) staff will be completed at this BLL. If BLL is persistent or rising, contact the local LHD.

**Chelation is NOT recommended in this BLL range.**

## BLL 20-44.9 µg/dL

### General medical evaluation & testing recommendations (given above), PLUS:

- Complete diagnostic evaluation, history and physical exam with neurodevelopmental assessment.

### Monitor BLLs:

- Confirmatory BLL draw within 2 weeks. Venous test preferred, capillary acceptable
- Retest BLL draw within 2 weeks to 1 month to ensure BLL is not rising. Venous test preferred, capillary acceptable.
- Monitor monthly and afterward based on the BLL trend. If retest result is in another range, follow up as for that range.

### General clinical management recommendations (given above), PLUS:

- Additional evaluations such as abdominal x-ray should be considered based on environmental investigation and history (e.g. pica for paint chips, mouthing behaviors, etc.) Gut decontamination may be considered if leaded foreign bodies visualized on x-ray.
- Nutrition consult

**Chelation is NOT recommended in this BLL range.**

## BLL 45-69.9 µg/dL (Urgent Medical Situation)

### General medical evaluation & testing recommendations (given above), PLUS:

- Any treatment for BLLs in this range and greater should be done in consultation with an expert. Contact IN Poison Control (1-800-222-1222) or Region 5 PEHSU (1-866-967-7337) for guidance regarding chelation, diagnostic tests, questions, etc.
- Medical evaluation with diagnostic evaluation.
  - Can be done in an outpatient setting for most patients.
  - Patients with concerning symptoms (encephalopathy, ataxia, seizures, etc.) should be evaluated at a hospital.

### Monitor BLLs:

- Confirmatory BLL draw within 48 hours.
- Consider reconfirming BLL, even for venous results.
- Retesting dependent on BLL range. Retest, venous only, 1 month after chelation therapy is completed.

### Chelation therapy:

- Consult with a provider experienced in managing chelation therapy (e.g. Indiana Poison Center, PEHSU).
- Chelation may be conducted at child's home if no lead hazards are present in the home. Active lead exposure should be stopped prior to administering chelation therapy. If hazards are present in the home, removing the child from that exposure should be a priority and occur as soon as possible. Alternative housing should be sought if needed to stop exposure and allow chelation to safely be provided in a patient's home. If no alternative housing can be found and/or if concerns exist regarding medical compliance, then hospitalization can be considered.
- Consider bowel decontamination as an adjunct to chelation if abdominal X-ray indicates enteral lead is present.
- Succimer can be prescribed.
- A minimum of 2 weeks between courses is recommended, unless more prompt treatment is indicated.
- Discontinue iron supplements.

# Childhood Blood Lead Medical Management Guidelines for Providers in Indiana

<ul style="list-style-type: none"> <li>• If confirmed in this range, monitor BLLs during chelation.</li> <li>• Retest every 2 to 4 weeks (or more based on most recent BLLs).</li> <li>• Modify treatment guidelines if BLL remains elevated.</li> <li>• Monitor frequently until BLL declines.</li> </ul> <p><b>General clinical management recommendations (given above), PLUS:</b></p> <ul style="list-style-type: none"> <li>• Evaluate whether hospitalization is needed to reduce lead exposure (Managed with assistance of experienced provider).</li> <li>• Notify LHD if admitted or chelation administered.</li> </ul>	<ul style="list-style-type: none"> <li>• Monitor for anemia and neutropenia.</li> </ul> <p><b>Post-Chelation Therapy Guidelines:</b></p> <ul style="list-style-type: none"> <li>• Repeat venous lead test in 1 to 3 weeks after hospital discharge.</li> <li>• Repeat venous lead test every 2 weeks for 6 to 8 weeks after hospital discharge.</li> <li>• Monitor lead level closely for 4 to 6 months after chelation. If the lead level “rebounds” to pre-treatment levels, consider repeat chelation therapy.</li> <li>• Minimum of two-week intervals is needed between chelation courses.</li> </ul>
<b>BLL <math>\geq</math> 70 <math>\mu\text{g}/\text{dL}</math> (Medical Emergency)</b>	
<p><b>General medical evaluation &amp; testing recommendations (given above), PLUS:</b></p> <p><b>Monitor BLLs:</b></p> <ul style="list-style-type: none"> <li>• Confirmatory BLL draw done immediately, emergency lab test, considered <b>Medical Emergency</b>. Venous test is preferred.</li> <li>• Retesting dependent on BLL range. Retest within 1 week to 1 month to ensure BLL is not rising.</li> <li>• Retest, venous only, 1 month after chelation is completed.</li> <li>• Monitor monthly and afterward based on the BLL trend. If retest result is in another range, follow up as for that range.</li> </ul>	<ul style="list-style-type: none"> <li>• Any treatment for BLLs in this range should be done in consultation with an expert.</li> <li>• Refer to CDC and American Academy of Pediatrics recommendations related to chelation management.</li> </ul> <p><b>General clinical management recommendations (given above), PLUS:</b></p> <ul style="list-style-type: none"> <li>• Follow chelation therapy and post-chelation therapy guidelines listed above.</li> </ul>

## Resources:

1. CDC: <https://www.cdc.gov/nceh/lead/>
2. Environmental Health Specialty Units (PEHSUs): <https://childrensenviro.uic.edu/>
3. AAPs Bright Futures Guidelines: <https://brightfutures.aap.org/Pages/default.aspx>
4. Indiana Department of Health, Lead and Healthy Homes Division: <https://www.in.gov/health/leadsafe/>
5. Indiana Poison Control: 1-800-222-1222, <https://indianapoisoncenter.org/>

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