

PUBLIC HEALTH REFERENCE SHEET

Lead Poisoning (Pediatric)



Name	Lead Includes: Children 6 years of age and under
Reservoir & Transmission	Homes built before 1978 (when lead-based paints were banned) probably contain lead-based paint. When the paint peels and cracks, it makes lead dust. Children can be exposed to lead when they swallow or breathe in lead dust. Certain water pipes may contain lead. Lead can be found in some products such as toys and jewelry. Lead is sometimes in candies or traditional home remedies. Certain jobs and hobbies involve working with lead-based products, such as stain glass work, and may cause parents to bring lead into the home. Children who live near airports may be exposed to lead in air and soil from aviation gas used in piston engine aircrafts.
Incubation Period	n/a
Common Symptoms	At low levels of exposure, children may be asymptomatic. High levels of lead exposure can produce a spectrum of illnesses across multiple body systems. Anemia, hypertension, renal impairment, immunotoxicity, and toxicity to the reproductive organs are possible; in severe cases, coma, convulsions, and death may occur. At low levels, cognitive ability may be permanently reduced. This may manifest in decreased intelligence quotient (IQ), decreased performance at school, and/or behavioral changes such as reduced attention span and increased antisocial behavior.
Gold Standard Diagnostic Test	A venous blood draw to test for blood lead reference value (BLRV) of 3.5 micrograms per deciliter ($\mu\text{g}/\text{dL}$)
Risk Groups	Children from low-income households and those who live in housing built before 1978, children less than 6 years old, immigrant and refugee children from less developed countries, adults working in industries or have hobbies that expose them to lead, pregnant women
Geographic Significance	Present worldwide, though the highest burden is in low- and middle-income countries

What is lead poisoning?

Lead poisoning or lead toxicity refers to exposures to lead that result in illness and require immediate medical attention. A confirmed case of lead poisoning is defined as being confirmed in children 6 years of age and under, with a venous blood lead reference value (BLRV) greater than or equal to 3.5 micrograms per deciliter ($\mu\text{g}/\text{dL}$).

How is lead poisoning transmitted?

Lead can be found throughout a child's environment:

- Homes built before 1978 (when lead-based paints were banned) probably contain lead-based paint. When the paint peels and cracks, it makes lead dust. Lead dust may be released during renovation or repainting projects in these older houses. Children can be exposed to lead when they swallow or breathe in lead dust.
- Certain water pipes may contain lead, usually within lead solder or lead-containing fixtures.
- Lead can be found in some products such as toys and jewelry.
- Lead is sometimes in candies or traditional home remedies.

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- Certain jobs and hobbies involve working with lead-based products, such as stain glass work; car battery industry; reloading firearm ammunition; and firing range or “shoot-house” exposures, which may cause parents or guardians to bring lead into the home.
- Children who live near airports may be exposed to lead in air and soil from aviation gas used in piston engine aircrafts.

The health effects of exposure are more harmful to children less than 6 years of age because their bodies and central nervous system are still developing and growing rapidly. Young children also tend to put their hands or other objects, which may be contaminated with lead dust, into their mouths; therefore, they are more likely to be exposed to lead than older children.

Who is at risk for lead poisoning?

All children who are at risk for lead exposure should be tested for lead poisoning. Some children are more likely to be exposed to lead than others:

- Children from low-income households and those who live in housing built before 1978 are at the greatest risk of lead exposure. Houses built before 1978 (before the use of lead in paint was banned) and houses in low-income areas (many of these homes were built before 1978) are more likely to contain lead-based paint and have pipes, faucets, and plumbing fixtures containing lead. Also, some African American persons are at a higher risk of lead exposure due to poor housing stock.
- Children less than 6 years old are at a higher risk of lead exposure. This is because their bodies are rapidly developing and more susceptible to taking in lead, if exposed. Young children also tend to put their hands or other objects into their mouths. This is why the most common source of lead exposure in young children is lead dust that they swallow after placing their lead-contaminated hands or other objects in their mouths.
- Immigrant and refugee children from less developed countries are at higher risk of being exposed to lead due to less strict rules protecting children from lead exposure, in their country of origin. Because of this, children who are immigrants, refugees, or recently adopted from less developed countries are also at risk for lead exposure.
- Pregnant women should know the risk of lead exposure because lead can pass to their fetus during pregnancy. Breastfeeding can also be a source of lead exposure to babies and children. Adults who are or have been exposed to lead can also pass lead to their babies when breastfeeding. Formula prepared using water contaminated with lead from leaded pipes and plumbing parts can also result in an infant being exposed to lead.
- Some adults, including U.S. Service members, work in industries or military occupations with lead materials or have hobbies that put them at risk for occupational and/or recreational exposures to lead. These adults may bring lead home with them and expose their families to lead without knowing. For example, a parent who works in battery manufacturing or renovation of older homes could bring home lead dust on their clothes, shoes, skin, hair, and hands. This dust can be tracked onto carpets, floors, furniture, and other surfaces that a child may touch. Adults who are exposed to lead in their workplace or from hobbies should take steps to keep them and their families safe from lead.

What are the signs and symptoms of lead poisoning?

Lead exposure in children is often difficult to see. Most children have no obvious immediate symptoms. Lead quickly enters the blood and can harm a child’s health. Once a child swallows lead, their blood lead level (BLL) rises. Once a child’s exposure to lead stops, the amount of lead in the blood decreases gradually. The child’s body releases some of the lead through urine, sweat, and feces. Lead is also stored in bones. It can take decades for lead stored in the bones to decrease. The presence of other underlying health conditions is possible.

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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
- Hearing and speech problems

What are possible complications from lead poisoning?

- Lower IQ
- Decreased ability to pay attention
- Underperformance in school
- Evidence that childhood exposure to lead can cause long-term harm

How is lead poisoning diagnosed?

A child's BLL is measured in micrograms of lead per deciliter of blood ($\mu\text{g}/\text{dL}$). Healthcare providers may use a capillary or venous sample for initial BLL screening. If the capillary results are equal to or greater than CDC's Blood Lead Reference Value (BLRV), providers should collect a venous sample. If the initial screening test used a venous sample, the patient does not need another venous draw.

How is lead poisoning treated?

There is no cure for lead poisoning. That is why preventing exposure to lead, especially among children, is important. Finding and removing sources of lead from the child's environment is needed to prevent further exposure. Chelation therapy might be recommended for children with a BLL of $45 \mu\text{g}/\text{dL}$ or greater.

While there is no cure, parents or guardians can help reduce the harmful effects of lead exposure by talking to their primary care provider and getting connected to learning, nutritional, and behavioral programs as soon as possible. Providers should use the following information if the patient's BLLs are between 3.5 and $19 \mu\text{g}/\text{dL}$:

- Provide education about common sources of lead exposure and information on how to further prevent exposure.
- During well-baby and well-child visits, check development to make sure age-appropriate milestones are being met.
- During well-baby and well-child visits, discuss diet and nutrition with a focus on iron and calcium intake.
- Conduct follow-up blood lead testing at recommended intervals based on the child's age.
- Centers for Medicare and Medicaid Services requires all children enrolled in Medicaid to get tested for lead at ages 12 and 24 months, or age 24–72 months if they have never been screened.
- For children not enrolled in Medicaid, CDC recommends focusing screening efforts on high-risk neighborhoods and children. Identify risk for lead poisoning based on the age of housing and social and demographic risk factors.
- Public health personnel and healthcare workers should use local data to develop screening plans that are responsive to local conditions. In the absence of such plans, CDC recommends universal blood lead testing.
- Report the test result to your state or local health department.
- Obtain an environmental exposure history to identify potential sources of lead.

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- Arrange for an environmental investigation of the home to identify potential sources of lead, as required.
- During an environmental investigation, professionals check the child's environment for possible causes of lead exposure and recommend ways to prevent further lead exposure.
- BLLs < 5 µg/dL may not trigger a Department of Housing and Urban Development (HUD) environmental investigation when the housing is covered by the HUD's Lead Safe Housing Rule. Additionally, environmental investigations for BLLs that are 3.5–19 µg/dL vary based on jurisdictional requirements and available resources.
- Ensure the child does not have iron deficiency using testing and treatment. Follow testing and treatment guidelines from the American Academy of Pediatrics (AAP), e.g., Bright Futures materials and tools (<https://www.aap.org/en/practice-management/bright-futures/bright-futures-materials-and-tools/>).
- Discuss the child's diet and nutrition with a focus on calcium and iron intake. Refer caregivers to supportive services, as needed (e.g., Special Supplemental Nutrition Program for Women, Infants, and Children).
- Check the child's development to ensure appropriate milestones are being met per AAP guidelines. Refer caregivers to supportive services, as needed (e.g., developmental specialists, Early Intervention Program).
- Provide follow-up BLL testing at recommended intervals.
- If indicated, consider BLL testing for older children and adults in the same household.

How can lead poisoning be prevented?

The most important step that parents, guardians, caregivers, healthcare providers, and public health professionals can take is to prevent lead exposure before it occurs. CDC supports primary and secondary lead exposure prevention. Primary prevention is the removal of lead hazards from the environment before a child is lead exposed. It is the most effective way to ensure that children do not experience harmful long-term effects of lead exposure. Secondary prevention includes blood lead testing and follow-up care and referral. It remains an essential safety net for children who may already be exposed to lead.

Protecting children from exposure to lead is important to lifelong good health. No safe BLL in children has been identified. Even low levels of lead in blood have been shown to affect learning, ability to pay attention, and academic achievement. While the effects of lead exposure may be permanent, if caught early, parents can do the following to prevent further exposure and reduce damage to their child's health:

- Get a blood test. Parents and guardians can talk to their child's healthcare provider about getting a blood lead test. A blood test is the best way to determine if a child has been exposed to lead. Based on blood lead test results, healthcare providers can recommend follow-up actions and care.
- Get the child's home checked. Have the home checked by a licensed lead inspector if they live in a home or building built before 1978. Those who rent should ask their landlord to have their home checked. Visit the Environmental Protection Agency's (EPA) web page to find a certified inspector or risk assessor.
- Hire trained contractors. When planning renovations, hire contractors who are trained in lead-safe practices. Visit EPA's web page to find a certified contractor.
- Regularly wet-mop floors, windows, and windowsills. Household dust can be a major source of lead in homes and buildings built before 1978.
- Leave shoes by the door or outside. This is especially important when someone works with lead or has a hobby that involves lead, such as construction or shooting firearms.

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- Shower and change clothes and shoes after working around lead-based products. This can keep lead dust from being tracked through the home and prevent families from being exposed.
- Protect soil. Cover bare soil with grass, mulch, or wood chips and prevent children from playing in bare soil that may be contaminated with lead. See the Lead in soil web page for more information.
- Avoid certain children's products and toys. Some toys, especially imported toys, antique toys, and toy jewelry may contain lead. Visit the Consumer Product Safety Commission's (CPSC) web page <https://www.cpsc.gov/Recalls> for photos and descriptions of currently recalled toys.

What are some public health considerations?

- Report cases once per person per calendar year. Any elevated lead test result that is not from venous blood (i.e., capillary blood [which includes finger and heel sticks and urine]) does not meet this case definition and should not be reported.
- Document the blood lead test results ($\mu\text{g/dL}$).
- Document the source of exposure, if known.
- Document whether the child lives in on- or off-post/base housing.
- Document whether the child attends daycare or school on a military installation.
- Document whether the child has recently had a significant extended stay at another residence (e.g., grandparents, other relatives, friends, etc.), summer camp, etc.
- Healthcare providers should test asymptomatic children for elevated blood lead concentrations according to Federal, local, and State requirements. Immigrant, refugee, and internationally adopted children also should be tested for blood lead concentrations when they arrive in the United States because of their increased risk. Blood lead tests do not need to be duplicated, but the pediatrician or other primary care provider should attempt to verify that screening was performed elsewhere and determine the result before testing is deferred during the office visit.

References:

Defense Health Agency. 2022. *Armed Forces Reportable Medical Events: Guidelines and Case Definitions*.

<https://www.health.mil/Reference-Center/Publications/2022/11/01/Armed-Forces-Reportable-Medical-Events-Guidelines>

"Childhood Lead Poisoning Prevention," Centers for Disease Control and Prevention (CDC), last reviewed September 20, 2023.

<https://www.cdc.gov/nceh/lead/default.htm>

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