

## LEAD SCREENING AND TESTING

### I. DEFINITION:

Lead is a naturally occurring metal found throughout the environment as a result of industrialization. Lead is toxic to humans at all levels. There is no safe level of lead and it serves no function in the human body. It is a poison that affects every system in the body. It is particularly harmful to the developing brain and nervous systems of fetuses and young children.

### II. ETIOLOGY AND EPIDEMIOLOGY:

- A. Lead poisoning is the number one environmental hazard for children and is one of the most common and preventable pediatric problems today. Primary prevention efforts should always be geared at eliminating the child's exposure to lead. Educating the parents about lead-based paint, lead dust as well as proper hand washing techniques should receive particular emphasis.
- B. The rate and absorption of lead in children is dependent upon how the child is exposed to the lead and the physiological characteristics of the child (age & nutritional status). Children are most commonly exposed in low doses over an extended period of time. Children are most vulnerable to the effects of lead because they absorb a greater percentage of lead per body unit and because the young child's brain and other organs are developing at such a rapid rate. Blood lead levels in children increase most rapidly at 6-12 months and peak at 18-24 months. Young children's normal hand to mouth behavior puts them at particular risk. Children with poor nutritional status are more susceptible to lead poisoning and toxicity. The most commonly used index of absorbed lead is the blood lead level, measured in micrograms per deciliter ( $\mu\text{g}/\text{dL}$ ) of blood.
- C. Sources and Pathways
1. **LEAD-BASED PAINT:** This is the most common high-dose source of lead exposure for pre-school children. Children are exposed to lead when they ingest or inhale lead-based paint-contaminated dust -or lead-based paint chips. About 83% of all homes built in the US before 1978 still contain lead-based paint. The older the house, the more likely it is to contain lead-based paint and to have a higher concentration of lead in the paint. Housing built before 1950 poses the greatest risk of exposure to children. About 18.0% of Oklahoma's housing stock was built before 1950.
  2. **SOIL AND DUST:** Children are exposed through ingestion or inhalation. Soil and dust act as pathways for lead that has been deposited by lead sources such as lead paint, leaded gasoline, and industrial or occupational sources. Scraping lead-based paint from old structures causes paint chips to fall onto and mix with the soil around the structure. Another source of paint chips being distributed, not only at the site but into neighboring areas, is "power washing" a house to remove flaking, loose paint. Since lead does not dissipate, biodegrade, or decay, the lead deposited into dust and soil becomes a long-term source of lead exposure for children.
  3. **OCCUPATION & HOBBIES:** A variety of work and hobby environments exposes people to lead and may result in lead exposures to their families. Oil field workers, smelter or foundry workers, auto body repair, battery recycling and building renovation or demolition are just a few of the approximately 120 different occupations that expose workers to lead. "Take Home" exposure may result when workers wear their work clothes home or launder them with the family laundry, or when they bring scrap material or industrial paint home from work (lead is still legal in industrial paint). Adults may unintentionally expose their children to lead dust from these occupations or hobbies when they have lead

dust on their clothing and pick up the children or transfer the lead onto common surfaces such as couches, bedding, and floors, etc. Many hobbies may involve potentially hazardous levels of lead such as furniture refinishing and making stained glass. Other activities that may be associated with lead exposure include using indoor firing ranges, cleaning guns, doing home repairs and remodeling, and making fishing weights.

4. TRADITIONAL REMEDIES: Healers using a non-Western pharmacopoeia may manufacture products which contain lead. The products are then distributed to recent immigrant groups by friends and relatives or local healers. Examples of such products are Azarcón and Greta, containing 70-90% lead and used for stomach problems; Surma, applied to the eyelids of children to improve eyesight or as a teething powder; and Pay-loo-ah, used for rashes and fever. These products typically are imported from India, Mexico and Southeast Asia. As immigrant populations increase and diversify, emerging sources of lead from traditional remedies, spices or cosmetic products are being identified as sources of lead exposure.
5. WATER: Lead levels are typically low in ground and surface water, but may increase once the water enters the water distribution system. Contamination of drinking water can occur at five points in or near the residential, school, public, or office plumbing, including: 1) lead connectors; 2) service lines or pipes; 3) lead soldered joints in copper plumbing; 4) water fountains and coolers; and 5) lead containing brass faucets and other fixtures.
6. FOOD: Lead in foods comes from several sources. 1) Soil in which the plant is grown 2) Food processing, (including lead leaching from some types of metal cans (imported) 3) Imported foods or food wrappers that contain lead in the ink (especially candy wrappers on candy from Mexico), 4) Improperly fired ceramic ware, leaded crystal, 5) Transfer of lead from environment onto food through poor food handling practices.
7. AIR: Lead use in gasoline has been markedly reduced. Previous use resulted in widespread contamination of soil and dust. Industrial activities may result in localized exposures to lead, including burning solid waste in incinerators and sandblasting or demolishing bridges and other lead-painted metal structures. Inhalation of airborne lead is a minor exposure pathway except around point sources such as smelters and battery manufacturing plants. Children who live near major highways or industrial areas where lead was a product or by-product are at higher risk for elevated lead levels.
8. TOYS, OBJECTS: Lead is sometimes used in the manufacture of items meant for children such as toys or jewelry often found in vending machines. Lead is inexpensive and durable and often unregulated in other countries. Many imported items contain unsafe amounts of lead either in the paint or within the plastic or metal components that make up the object. Young children commonly chew on or mouth items and could be exposed to lead in this fashion. Children with pica are at particular risk for eating items which could contain lead and are not intended for human consumption.

### III. CLINICAL FEATURES: (effects of lead)

#### A. Signs & Symptoms

1. An individual with a low elevation of blood lead, (5-10 µg/dL) most likely will not exhibit signs & symptoms of lead toxicity. However, permanent damage to the child may occur with chronic exposures at this level.
2. With increasing blood levels the following may be observed:

- a. Sleep disturbances
- b. Irritability/fussiness
- c. Anemia
- d. Abdominal pain
- e. Behavior problems
- f. Decreased intelligence
- g. Developmental delays
- h. Learning disabilities
- i. Impaired neurobehavioral development
- j. Decrease in stature or growth
- k. Decreased ability to maintain a steady posture
- l. Decreased hearing acuity
- m. Unexplained seizures
- n. Coma
- o. Death

B. Possible complications of severe, long term lead poisoning include:

1. Developmental delay
2. Seizures
3. Acute lead encephalopathy
4. Coma
5. Death

IV. MANAGEMENT PLAN:

A. Assessment Based Testing

1. The Oklahoma Childhood Lead Poisoning Prevention Program (OCLPPP) recommends that health care providers screen all children at 12 and 24 months of age with the Lead Exposure Risk Assessment Questionnaire (LERAQ), OSDH Form 386. If the parent/guardian answers "yes" or "don't know" to any of the questions, then a blood lead test should be administered. By 72 months of age all children should be screened with the LERAQ if they have never been previously screened.

**NOTE: If the child is at risk, the LERAQ may be administered as early as 6 months of age.**

2. Complete blood lead screening at appropriate intervals based on results of the Lead Exposure Risk Assessment Questionnaire (LERAQ).
  - a. All children should be screened at least by 12 months of age and yearly thereafter, using the LERAQ. Children's developmental milestones vary, most children are very mobile and exhibit mouthing behavior at 12 months old. However, children as young as 6 months old may be at risk for lead poisoning from their environment or by early attainment of developmental milestones.
  - b. If a child's LERAQ from a previous visit had a "yes" or "don't know" answer with the resulting blood lead test that was  $<5 \mu\text{g/dL}$  AND there have been no changes in the answers on the LERAQ, a blood lead test is not necessary.
  - c. When considering a blood lead test result for patient retest or follow-up, round any values reported with decimals to the nearest whole number (e.g., 4.5 rounded to 5 and 4.4 rounded to 4).
  - d. Capillary Blood lead results  $\geq 5 \mu\text{g/dL}$  must be confirmed with a venous blood test.
  - e. Always use venous blood sampling when conducting follow-up of

- elevated blood lead levels ( $\geq 5 \mu\text{g/dL}$ ).
- f. Health care providers may use capillary blood sampling when conducting routine screening.
- \* A venous blood lead test may be performed at first draw. Only elevated capillary blood lead tests need to be confirmed with a venous draw.
- g. Send capillary and venous blood samples to Tamarac Medical, Inc. for analysis. Contact Tamarac at 1-800-842-7069 for testing supplies and hand cleaning products

## B. Screening and Testing Schedule

Childhood lead poisoning screening is initiated by the administration of the LERAQ to determine if a blood lead test is needed. In order to be confirmed as an elevated blood lead level, the results of a capillary test must be confirmed by a second blood draw obtained through venous testing. Once an elevated blood lead level is confirmed, the child is to be followed-up by retesting of venous blood.

### 1. Routine Screening

Assessment of the child for lead exposure risk is to occur yearly at appropriate clinic visits starting by 12 months through 72 months of age. The Lead Exposure Risk Assessment Questionnaire (LERAQ, OSDH form #386) is to be used to direct and document lead poisoning screening. The LERAQ may be used on younger children if there is a question of possible exposure.

### 2. Children who receive SoonerCare/Medicaid

The current Oklahoma Health Care Authority (OHCA) guidelines state that children who receive Medicaid will receive blood lead screening either through capillary or venous testing. All babies and toddlers need to be tested for lead at:

- 12 months (1 year old)
- 24 months (2 years old) and
- Children under 6 years old with no previous blood lead test.

### 3. Confirmatory Testing

Blood lead levels  $\geq 5 \mu\text{g/dL}$  that are obtained through capillary testing must be confirmed by venous testing. The higher the capillary test result, the more urgent the need for confirmatory testing. See Appendix 1 – Provisional Guidelines for Management of Blood Lead Levels in Children – June 2012 for confirmatory testing timeline.

### 4. Follow-up Testing

- a. Follow-up venous blood lead testing is performed to determine if a venous blood lead level is decreasing or increasing.
- b. See Appendix 1 – Provisional Guidelines for Management of Blood Lead Levels in Children – June 2012 for venous blood lead level management.
- c. Educate parents about key sources of lead exposure and how to reduce exposure to lead.
- d. Educate on diet high in iron and calcium.
- e. Issue written lead educational material.

- f. Educational intervention must be modified if a child's blood level continues to increase.

C. Consultation and Referral

1. Refer for medical evaluation as indicated by blood lead levels.
2. Refer to nutritional counseling if indicated by diet history.
3. The Oklahoma Childhood Lead Poisoning Prevention Program (OCLPPP) will notify and consult with local county health department personnel to arrange for an environmental investigation of the child's home to determine the source of lead exposure. This occurs for children who have a confirmed (venous) blood lead level of 20 µg/dL or have had two tests (at least three months apart) with venous results of 15-19 µg/dL. The OCLPPP staff will arrange for a Certified Lead-Based Paint Risk Assessor/Inspector to conduct the Environmental Investigation in collaboration with the local health department and will provide the family with recommendations to remove the source of lead exposure for the child.

D. Prevention

1. Educate parents about lead poisoning and how to reduce exposure to lead.
2. Provide screening for children using the Lead Exposure Risk Assessment Questionnaire. (OSDH # 386)
3. Obtain a blood lead test based on response to the Lead Exposure Risk Assessment Questionnaire. (OSDH # 386)
4. Work with appropriate groups in the public and private sectors to make sure that lead poisoned children receive appropriate medical, environmental, and social service follow-up.
5. Coordinate with health providers and others involved in lead-poisoning prevention activities.

E Follow-up

1. Determine tracking priority utilizing professional judgment.
2. Notify family of screening appointments at appropriate ages as determined by risk category and blood lead level.

F. Patient outcome

Blood lead level will remain below 5 µg/dL.

REFERENCES:

Low Level Lead Exposure Harms Children: A Renewed Call for Primary Prevention; Report of the Advisory Committee on Childhood Lead Poisoning Prevention of the Centers for Disease Control and Prevention January 4, 2012.

Centers for Disease Control and Prevention, U.S. Department of Health and Human Services. Preventing Lead Poisoning in Young Children. August 2005.

Centers for Disease Control and Prevention, Screening Young Children for Lead Poisoning: Guidance for State and Local Public Health Officials. Washington, DC: United States Department of Health and Human Services, Public Health Services. November 1997.

Harvey, Birt, M.D., Editor, Centers for Disease Control and Prevention. Managing Elevated Blood Lead Levels Among Young Children: Recommendations from the Advisory Committee on Childhood Lead Poisoning Prevention. March 2002.

**Oklahoma Childhood Lead Poisoning Prevention Program  
2012 Lead Exposure Risk Assessment Questionnaire (LERAQ)**

CHILD'S NAME \_\_\_\_\_

DATE OF BIRTH \_\_\_\_\_

Date: \_\_\_\_\_ Age: \_\_\_\_\_ Current Residential Zip Code: \_\_\_\_\_

1. Does your child have Medicaid (SoonerCare)? If yes this child must have a blood lead test at 12 and 24 months of age (or, if older than 24 months, at least one test before 6 <sup>th</sup> birthday).	Yes	No	Don't Know
2. Does your child live in a high risk ZIP code area? (see a list of high risk ZIPs on this form )	Yes	No	Don't Know
3. Does your child live in or often visit a house or child care site with chipped or peeling paint that was built prior to 1950?	Yes	No	Don't Know
4. Does your child live in or often visit a house or child care site built prior to 1950 with renovation, repairs or remodeling that were done in the last 6 months?	Yes	No	Don't Know
5. Does your child live in or often visit a house or child care site that has vinyl or plastic mini blinds?	Yes	No	Don't Know
6. Does your child have friends, siblings, house mates, or a play mate that has or did have lead poisoning?	Yes	No	Don't Know
7. Does your child live with an adult who has a job or hobby where lead is used? Examples would be: oil field worker, bridge painter, demolition or renovation of buildings, automobile work with batteries or radiators, lead solder, metal plating, furniture refinishing, leaded glass, lead shot or bullets and lead fishing sinkers.	Yes	No	Don't Know
8. Is your child given any home or folk remedies or cosmetics such as imported items called Greta, Azarcon, Rudea, Kohl or does your child eat food cooked in or served from pottery made outside the United States?	Yes	No	Don't Know
9. Does your child chew on or mouth trinket jewelry or toys found in vending machines?	Yes	No	Don't Know

Lead Poisoning Prevention Program  
Screening and Special Services  
Oklahoma State Department of Health  
1000 NE 10<sup>th</sup> Street

Telephone: (405) 271-6617  
Toll Free: 1-800-766-2223

**HIGH RISK ZIP CODES**

73106    73108    73111    73119    73521    74104    74110    74127    74401    74447  
73107    73109    73117    73129    73701    74106    74115    74354    74403    74631  
74848

**Purpose:** The LERAQ is to be used to screen for possible lead exposure in children 6 - 72 months of age.  
**Use:** This assessment may be administered by medical staff or teacher, or completed by the child's parent or guardian.  
**Any "Yes" or "don't know" answer is considered a positive answer thus requires the child to have a blood lead test.**

According to OCLPPP Case Management Guidelines, if a child has a blood lead test <5 µg/dL, reassess with the LERAQ in 1 year. No additional testing is necessary unless an exposure risk change has occurred. This Guideline does not supersede the federal CMS requirement that children enrolled in SoonerCare receive a blood lead test at 12 and 24 months of age as defined in the Child Health Check Up, also known as Early and Periodic Screening, Diagnosis and Treatment (EPSDT).

**Routing and Filing:** Retain this record in the child's record to review annually.

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**Provisional Guidelines for Management of Blood Lead Levels in Children**  
June 2012

- All capillary blood lead results  $\geq 5$   $\mu\text{g/dL}$  must be confirmed with a venous specimen.
- Primary management of lead poisoning relies on source identification and removal from exposure.
- Treatment decisions should be made in consultation with a physician knowledgeable about lead poisoning and medical management.
- For any child with a confirmed elevated blood lead level, risk assessment (LERAQ) in 1 year after 2 consecutive blood lead tests are below 5  $\mu\text{g/dL}$ .

**CAPILLARY BLOOD LEAD LEVELS**

Blood Lead ( $\mu\text{g/dL}$ )	Significance	Management
< 5	Not Elevated	Risk assessment (LERAQ) in 1 year. No additional action is necessary unless an exposure risk change has occurred.
$\geq 5$	Needs Confirmation	Confirm results with a venous specimen.

**CONFIRMATORY TESTING TIMELINE**

If capillary (screening) blood lead level ( $\mu\text{g/dL}$ ) is:	Perform venous(diagnostic) confirmatory blood test:
5 – 14	Within 3 months
15 - 19	Within 1 month
$\geq 20$	Within 1 week

**VENOUS BLOOD LEAD LEVELS**

Blood Lead ( $\mu\text{g/dL}$ )	Significance	Management
< 5	Not Elevated	Risk assessment (LERAQ) in 1 year. No additional action is necessary unless an exposure risk change has occurred.
5 – 14	Low Elevation	Rescreen with a venous test every 3 months. Provide family with lead education including nutritional and environmental interventions.
15-19	Moderate Elevation	Rescreen with a venous test every 3 months. If blood lead level remains between 15-19 $\mu\text{g/dL}$ after 2 venous samples at least 3 months apart, proceed according to actions for 20-44 $\mu\text{g/dL}$ range. Contact OCLPPP for consultation.
20-44	High Elevation	Environmental Investigation should be initiated. Refer for medical management. Child needs a venous test every 2 months. Pharmacological treatment may be indicated. Contact OCLPPP for consultation.
45-69	Severe Elevation	Children in this range need both medical and environmental intervention. Refer for medical management. Child needs a venous test every 2 months. Pharmacological treatment may be indicated. Contact OCLPPP for consultation.
$\geq 70$	Emergency	Children in this range need immediate medical treatment and environmental intervention. Contact OCLPPP for consultation.

For more information or additional copies of this form, contact the Oklahoma Childhood Lead Poisoning Prevention Program at 405-271-6617 or toll free 1-800-766-2223 or email [OKLPPP@health.ok.gov](mailto:OKLPPP@health.ok.gov).

