Lead Poisoning–Children (0-15 years old)

PROTOCOL CHECKLIST

- ☐ Enter available information into Merlin upon receipt of initial report.
- ☐ Review information on the disease and its epidemiology (section 2) and case definition (section 3).
- ☐ Review the blood lead levels (BLL) to determine the case classification (section 3.C).
- ☐ Report the case in Merlin.

For suspect cases:

- ☐ Complete the case report form (CRF) based on the reported BLL and the child's age.
  - ☐ Report the case in Merlin.
  - ☐ Refer to the follow-up venous testing schedule (section 4.A).

- ☐ Re-assess the case definition after the follow-up test is received (section 4.A.1).
  - ☐ No follow-up test completed? Close the case in Merlin.
  - ☐ Not classified as a confirmed case? Close the case in Merlin.
  - ☐ Classified as a confirmed case? Follow the guidelines below.

For confirmed cases:

- ☐ Conduct a routine investigation (section 4.C).
  - ☐ Interview the parent/guardian.
    - ☐ Assess environmental risk factors, household contacts' occupational status, eating habits, behaviors, health status, and housing situations.
    - ☐ Educate about sources of lead, exposure pathways, and methods of prevention.
    - ☐ Recommend counseling and provide educational materials with nutrition and housekeeping recommendations.
    - ☐ Recommend that household contacts and siblings less than 6 years old be tested.
  - ☐ Notify the health care provider (only for children less than 6 years of age).
    - ☐ Ensure that follow-up tests are performed according the recommended guidelines.
    - ☐ Recommend that household contacts and siblings less than six years old be tested.
    - ☐ Recommend that the health care provider consider providing developmental screenings.
    - ☐ Recommend that the health care provider discuss long-term developmental follow-up with the parent/guardian.
    - ☐ Recommend that the health care provider refer the child to developmental programs and community resources, if needed.

Required for children with a confirmed BLL ≥20 µg/dL or two confirmed BLLs ≥15 µg/dL taken more than 12 weeks apart.

- ☐ Conduct an enhanced investigation (section 4.D).
  - ☐ Provide the parent/guardian with contact information for certified Environmental Protection Agency (EPA) lead risk assessors in their area http://cfpub.epa.gov/flpp/search.cfm?Applicant_Type=firm.
  - ☐ Refer cases for lead-related housing remediation services (if needed).

- ☐ Conclude the investigation (section 4.E).

Lead Poisoning–Child (0-15 Years Old)

1. DISEASE REPORTING

A. Purpose of reporting and surveillance

1. To estimate the prevalence of elevated blood lead levels (BLLs) among at-risk children in Florida

2. To ensure appropriate and timely follow-up care of children with elevated BLLs

3. To prevent the occurrence of new cases and the worsening among existing cases by early identification of lead exposure sources and disease risk factors

4. To gather epidemiologic and environmental data on lead poisoning cases to target future public health interventions

B. Legal reporting requirements

- Lead poisoning is listed as a notifiable disease in the State of Florida under Statute 381.0031, Rule 64D-3, Florida Administrative Code. Local health departments, health care providers, laboratories, and other public health personnel are required to report the occurrence of notifiable diseases as defined in the rule. BLLs ≥10 micrograms per deciliter (µg/dL) must be reported to the Florida Department of Health (DOH) by the end of the next business day following receipt of laboratory findings.
- Local health departments, health care providers, laboratories, and other public health personnel that conduct analysis of blood lead samples are required to report all blood lead tests. Results <10 µg/dL produced by point of care instruments, such as the LeadCare® II, must be reported to the DOH within 10 business days. Electronic reporting of results is preferred.

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2. THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic agent

Lead, a heavy metal that does not break down, can accumulate in the body causing serious and permanent health problems to people of all ages. Lead poisoning can be acute or chronic. Acute lead poisoning occurs when an individual ingests or inhales a large amount of lead into the body over a short period of time. Chronic lead poisoning occurs when small amounts of lead are ingested or inhaled over a period of several months or years.

B. Description of illness

Childhood lead poisoning is a preventable, serious environmental health problem. Lead exposure is recognized as one of the most common environmental toxins for young children. The primary way in which most children are exposed to harmful levels of lead is through contact with deteriorating lead paint and lead contaminated dust. The typical hand-to-mouth activity of young children provides the pathway for lead to enter the body.

In most cases, children are exposed to lead by ingesting lead paint chips or dust contaminated by deteriorating lead paint. Interior dust can become contaminated with lead as the result of chipped or peeling paint in older dwellings (pre-1978 housing), friction caused by opening and closing windows with lead paint[1], or through the disturbance of lead paint during preparation of paint surfaces for repainting, paint removal, or remodeling. Less commonly, secondary sources such as water contaminated by its flow through lead pipes or brass fixtures, soil contaminated by lead dust, and certain consumer products that contain lead can be significant contributory sources. Young children absorb lead more efficiently than adults. Some of the protective mechanisms that are well developed in adults are immature in young children, thereby making them more vulnerable to the effects of some toxic chemicals.[1]

Exposure to lead is associated with a range of serious health effects among young children. Lead is a systemic toxin that affects virtually all body systems. Lead exposure has been associated with anemia, hearing loss, diminished skeletal growth, delayed pubertal development, dental caries, and impaired neurologic development.[1] Lead exposure is an important cause of preventable brain injury and neurodevelopmental dysfunction that is associated with detrimental effects on children's cognitive and behavioral development, including measurable declines in IQ. Although there is no established threshold for the harmful effects of lead, the DOH has defined BLLs ≥10 µg/dL as the definition of lead poisoning and the action level for public health investigation.

C. Sources of lead exposure

Lead-based paint hazards: Lead-based paint found in older homes is still the most important source of lead exposure in the environment. As homes with lead-based paint age, the paint begins to deteriorate. Deterioration is exacerbated around friction surfaces, surfaces affected by weatherization, and areas exposed to leaks or other types of structural damage. The dust created when paint breaks down is easily accessible to children since it often settles on floors or bare soil where they are most likely to play. Renovation or construction work done in older homes containing lead-based paint or other leaded material (e.g., ceramic tile, pipes, or glass) can also create lead dust in the environment of a child.

Although it is difficult to determine the actual number of properties in Florida that contain lead-based paint hazards, a review of the 2000 U.S. Census data for Florida indicates that there are approximately 433,000 housing units built before 1950 and approximately two million housing units built before 1970. This is a concern because lead-based paint containing up to 50% lead was in widespread use through the 1940s. The use and manufacture of lead-based paint declined during the 1950s and thereafter; however, lead-based paint continued to be available for use in residential dwellings until 1978.

Take-home lead from occupations and hobbies: A number of businesses and industries in Florida use lead or lead products. By-products from these industries have been linked with elevated BLLs in adults and children. Parents or caretakers whose occupations or hobbies expose them to lead have the potential to transfer hazardous lead dust from their place of work or recreation to the car, home, or yard where it becomes accessible to young children or women of childbearing age. This type of exposure is called "take-home" exposure.

Consumer products: In Florida, consumer products containing unsafe levels of lead are a small yet concerning source of lead exposure to children. Products of significance include children's jewelry, toys, vinyl mini-blinds, lead-glazed pottery, fishing lures and sinkers, tile, and ammunition.

For information on previously recalled products with unsafe levels of lead, please refer to the following Consumer Product Safety Commission (CPSC) website: http://www.cpsc.gov/.

Home or folk remedies and cultural practices: Some common home or folk remedies and/or cultural practices involve lead. These practices include giving children azarcon or greta for health ailments, using kohl or surma for face and body painting or decoration, and eating imported candies.

Hobby/Occupational practices: Using lead-glazed or painted pottery, hobbies, and occupations associated with cottage industries (e.g., battery recycling, car repair) may be a source of lead exposure.

D. At-risk populations

Individuals from all social and economic levels can be affected by lead poisoning. Children under the age of six years are considered to be at highest risk because they tend to put their hands or other objects into their mouth, they absorb a greater percentage of lead, and their developing body is more vulnerable to the effects of lead. Differences in the rate of lead poisoning have been identified by race and ethnicity, with non-Hispanic blacks and Mexican Americans being at higher risk than non-Hispanic whites. Children with a recent immigration status or from households below the federal poverty level are more likely to have elevated blood lead levels, independent of housing age. High-risk populations include those residing in older homes (built before 1978) or those whose home is located in a ZIP code with a high prevalence of lead poisoning or located where the proportion of homes built before 1978 is above the national average.

E. Treatment

Recommend primary care providers consider oral chelation therapy treatment (e.g., succimer) for cases with a confirmed BLL ≥45 µg/dL.

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3. CASE DEFINITION

A. Clinical description

Often asymptomatic but may result in impaired neurobehavioral development, low IQ, slow nerve conduction, peripheral neuropathies, and encephalopathy.

B. Laboratory criteria for diagnosis

Confirmatory:

- Blood lead level ≥10 µg/dL measured from a venous specimen
  OR
- Blood lead levels ≥10 µg/dL measured from **two** capillary specimens, unknown specimens (i.e., venous or capillary), or a combination of capillary and unknown specimens taken **within 12 weeks** of one another.

Supportive:

- Blood lead level ≥10 µg/dL measured from a single capillary specimen or unknown specimen (i.e., venous or capillary).

C. Case classification

Confirmed: A person with confirmatory laboratory evidence

OR

Suspect: A person with supportive laboratory evidence

D. Comment

The DOH considers all blood lead tests to be evidence of a suspicion of lead poisoning, thus they **must be reported** to the DOH by laboratories, hospitals, or physicians who conduct on-site blood lead analysis. Requiring these entities to report all blood lead results to the DOH enables the Lead Poisoning Prevention Program (LPPP) to assess disease prevalence and screening rates. This provides the necessary data to identify risk areas in Florida and design an effective prevention program. Although all blood lead test results must be reported by laboratories, hospitals, or physicians who conduct on-site blood lead analysis, local health department disease investigators should only report **suspect and confirmed cases in Merlin**. In addition, lead poisoning disease investigations should be performed for children 0-15 years of age whose test results meet the definition of confirmed as described above in the "laboratory criteria for diagnosis" (section 3B).

Once a child has had an elevated BLL of ≥10 µg/dL, if he or she has additional follow-up test results, regardless of the test type, these confirmed results are to be included with initial case information and **not reported** as a new case.

Capillary tests with an initial BLL ≥10 µg/dL with a venous or capillary follow-up test result ≥10 µg/dL, taken **within 12 weeks** of one another, should be classified as a confirmed case. If a case is initially reported as suspect (section 3) and then a confirmatory venous or capillary test result is received, the suspect case needs to be updated to a confirmed case.

The Childhood Lead Poisoning Screening and Case Management Guide is a resource available for local health department disease investigators and health care providers. It contains additional information on disease investigation, lead poisoning testing, case management, and requirements for environmental investigations. This guide can be found at: http://www.floridahealth.gov/environmental-health/lead-poisoning/_documents/childhood-leadpoisoning-screening-casemanagement-guide.pdf.

Questions regarding disease investigations for lead poisoning should be directed to the DOH, LPPP at (850) 245-4401.

If a woman is pregnant, her BLL should be <5 µg/dL from the time of conception throughout pregnancy. If a pregnant woman's BLL is ≥5 ug/dL, refer her to her health care provider.

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4. CASE INVESTIGATION

A. Suspect cases

When the local health department receives an **initial** elevated blood lead laboratory report (capillary or unknown test type classifying the child as a suspect case), the designated disease investigator should enter the child's demographic, clinical, and risk/source information, attach **follow-up** blood

lead test results (elevated and non-elevated results), and document any other relevant information into Merlin **under code 94890.** The case should be classified as "suspect."

Children with an elevated capillary test or unknown test type (≥10 µg/dL) should have follow-up confirmatory venous testing consistent with the schedule below. The need for additional testing is based on assessment and follow-up test results.

If there is reason to believe the BLL may be increasing rapidly or if the child is younger than 1 year of age, consideration should be given to repeat the blood lead test sooner than indicated in the table below.

Follow-up confirmatory venous testing for a capillary or unknown test type with a BLL ≥10 µg/dL:

If capillary result is	Request a confirmatory venous test from the provider within
10 – <20 µg/dL	12 weeks
20 – <45 µg/dL	4 weeks
45 – <60 µg/dL	48 hours
60 – <70 µg/dL	24 hours
≥70 µg/dL	Immediately as an emergency lab test

If a follow-up blood lead test is not reported for a suspect case within 12 weeks, close the case by selecting the case closure reason "out of compliance" in Merlin on the follow-up/closure extended data screen.

Upon receiving a confirmatory BLL, re-assess the case status:
1. If the follow-up BLL is <10 µg/dL, then close the case in Merlin.
2. If the follow-up BLL is ≥10 µg/dL, conduct the investigation following the guidelines described below.

B. Confirmed cases

Lead poisoning disease investigation is initiated only when a child (**0 to15 years old**) is classified as a **confirmed** case.

When the local health department receives an elevated blood lead laboratory report (classifying the child as a confirmed case), the designated disease investigator should enter the child's demographic, clinical, and risk/source information, attach **follow-up** blood lead test results (elevated and non-elevated results), and document any other relevant information into Merlin **under code 94890.** If the case is already in Merlin as a suspect case, then update the status to "confirmed."

Non-Florida cases must be reported to the Bureau of Epidemiology. Upon reporting, close the case in Merlin citing "report only."

Cases should remain **'open'** until the case meets the closure criteria (section 4E). Disease investigation emphasis should be placed on responding to children with the highest BLL and children less than 6 years old with any elevated BLL.

C. Routine investigation

- **For BLLs of 10 to <15 µg/dL:**
  1. Report the case in Merlin.
  2. Interview the parent/guardian by phone to assess the environmental risk factors, household contacts' occupational status, eating habits, behaviors, health status, and housing situation. Findings from this interview should be reported in Merlin on the risk/sources extended data screen.
  3. Educate the parent/guardian about sources of lead, exposure pathways, and methods of prevention (e.g., lead safe work practices). Educational outreach provided by the disease investigator should be documented in Merlin on the follow-up/closure extended data screen.
  4. Provide the parent/guardian with counseling and educational materials regarding nutrition and housekeeping recommendations.
  5. Inform the parent/guardian to have siblings and other household contacts less than 6 years old tested for lead poisoning. Ensure that the health care provider conducts follow-up blood lead tests according to the recommended Childhood Lead Poisoning Screening and Case Management Guidelines table provided below (page 8).
     - Recommend that the health care provider consider performing developmental screenings.
     - Recommend that the health care provider discuss with the parent/guardian about provisions for long-term developmental follow-up.
     - Recommend that the health care provider refer the child to developmental programs and community resources, if needed. If known that such referrals were made, document the information in Merlin on the follow-up/closure extended data screen.
  6. Recommend the child be retested by their health care provider within 12 weeks.

- **For BLLs of 15 to <20 µg/dL:**
  1. Follow the steps indicated for investigation of children with BLLs of 10 to <15 µg/dL.
  2. Recommend the child be retested by their health care provider within 8 weeks.

- **For BLLs of 20 to <44 µg/dL:**
  1. Follow the steps indicated for investigation of children with BLLs of 10 to <15 µg/dL.
  2. Conduct an enhanced disease investigation (section 4D).
  3. Recommend the child be retested by their health care provider within 4 weeks.

- **For BLLs of 45 to <70 µg/dL:**
  1. Follow the steps indicated for investigation of children with BLLs of 10 to <15 µg/dL.
  2. Conduct an enhanced disease investigation (section 4D).
  3. Case follow-up and enhanced disease investigation should begin within 48 hours of notification.
  4. If chelation therapy is performed, document the specific treatment information in Merlin on the clinical information extended data screen.
  5. Ensure retesting by their health care provider within 48 hours.

- **For BLLs ≥70 µg/dL**:
  1. Children with BLLs ≥70 µg/dL constitute a medical emergency and must be hospitalized immediately.
  2. Children with such high BLLs are at risk for severe, permanent neurologic damage and must be given highest priority for follow-up.
  3. Follow the steps indicated for investigation of children with BLLs of 10 to <15 µg/dL.

4. Conduct an enhanced disease investigation (section 4D).
5. Case follow-up and enhanced disease investigation should begin within 24 hours of notification and should include the child's home and potential sites of exposure, such as a relative's home or a day care center.

Children with confirmed elevated BLLs should have follow-up testing consistent with the schedule below.

Follow-up of confirmed BLL	Follow-up test within
10 – <15 µg/dL	12 weeks
15 – <20 µg/dL	8 weeks
20 – <45 µg/dL	4 weeks
45 – <70 µg/dL	48 hours
≥70 µg/dL	Admit to hospital; repeat testing 1-3 weeks after discharge

- **Lead poisoning investigation in older children (6-15 years old):**
  While lead poisoning prevention efforts primarily target children under 6 years of age, who are most vulnerable to lead poisoning, adverse health effects are associated with exposure to lead at any age. Children over age five with elevated BLLs require the same components of follow-up services as younger children, including follow-up blood lead testing, risk reduction education, nutritional counseling, developmental screening, environmental management, and medical treatment, depending on BLLs. For children over age five, local health departments must inquire about the reason for a lead test (e.g., concern that the child had a possible exposure to lead, including any specific or suspected source(s) of potential exposure), previous lead exposure and treatment history, household exposures, family history, and environmental risk factors.

D. Enhanced investigation

An enhanced investigation is required for lead poisoned children **(0-15 years old)** with a **confirmed BLL ≥ 20 µg/dL** OR **two confirmed BLLs ≥ 15 µg/dL taken more than three months apart.**

- **Conduct an environmental health investigation:**
  A certified EPA lead risk assessor should conduct the environmental inspection. If you need assistance in obtaining a risk assessor, please click on the following link: http://cfpub.epa.gov/flpp/search.cfm?Applicant_Type=firm or contact the LPPP at (850) 245-4401. An inspection should be conducted at the child's home and other sites where the child spends a significant amount of time. An environmental history of the child's exposure can be used to identify possible sources of lead exposure. Measurements of environmental lead levels, including, house dust, paint that is not intact or is subject to friction, exposed soil, especially in a play area, and other appropriate media that could promote lead exposure. Findings from this investigation should be reported in Merlin on the environmental investigation extended data screen.

  Refer cases for lead-related housing remediation services (if needed). The environmental risk assessor will make recommendations for lead remediation and facilitate interventions to reduce ongoing exposures to lead. Remediation of lead in residential settings should be done in accordance with the EPA's Renovation, Repair and Painting (RRP) Rule. If remediation or

abatement was performed, report the information in Merlin on the environmental investigation/follow up/closure extended data screen.

E. Conclude the investigation

The case should be closed when the child's BLL has declined below 10µg/dL for at least six months. A case can be closed based on administrative provisions if at least three documented attempts made to locate or gain access to the child's parent/guardian have failed. Document these attempts in Merlin on the follow-up/closure extended data screen.

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5. ROUTINE PREVENTION

Prevention recommendations for parents:

- Make sure your child does not have access to peeling paint or chewable surfaces painted with lead-based paint.
- Pregnant women and children should not be present in housing built before 1978 that is undergoing renovation. They should not participate in activities that disturb old paint or in cleaning up paint debris after work is completed.
- Create barriers between living/play areas and lead sources.
- Regularly wash children's hands and toys. Hands and toys can become contaminated from household dust or exterior soil. Both are known lead sources.
- Because household dust is a major source of lead, parents should wet-mop floors and wet-wipe windows and horizontal surfaces every 2-3 weeks. Windowsills and wells can contain high levels of leaded dust. They should be kept clean. If feasible, windows should be shut to prevent abrasion of painted surfaces or opened from the top sash.
- Prevent children from playing in bare soil; if possible, provide them with sandboxes. Parents should plant grass on areas of bare soil or cover the soil with grass seed, mulch, or wood chips, if possible. Until the bare soil is covered, parents should move play areas away from bare soil and away from the sides of the house.
- To further reduce a child's exposure from non-residential paint sources:
  - Avoid using traditional home remedies and cosmetics that may contain lead.
  - Avoid eating imported candies or foods containing chili or tamarind, especially from Mexico.
  - Avoid using containers, cookware, or tableware not shown to be lead free to store or cook foods or liquids.
  - Remove recalled toys and toy jewelry immediately from children (check lead recall lists).
- Shower and change clothes after finishing a task that involves working with lead-based products, such as stained glass work, bullet making, or using a firing range.
- You may also visit the DOH website for additional educational information on lead poisoning: http://www.floridahealth.gov/environmental-health/lead-poisoning/index.html.

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6. IMPORTANT LINKS

A. Florida Department of Health (DOH)
http://www.floridahealth.gov/%5C/healthy-environments/lead-poisoning/index.html

B. Centers for Disease Control and Prevention (CDC)
http://www.cdc.gov/nceh/lead/

C. Environmental Protection Agency (EPA)
http://www.epa.gov/lead/

D. EPA Renovation, Repair and Painting (RRP) Rule
http://www2.epa.gov/lead/renovation-repair-and-painting-program

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7. REFERENCES

A. Bearer, C.F. (1995). Environmental Health Hazards: How children are different from adults. Critical Issues for Children and Youths 5(2), 11-26.
B. Blood Lead levels- United States, 1999-2002. Centers for Disease Control and Prevention (CDC). MMWR Morbidity Mortality Weekly Report 2005 May 27; 54(20):513-6
C. Centers for Disease Control and Prevention. Interpreting and Managing Blood Lead Levels < 10 mcg/dL in Children and Reducing Childhood Exposures to Lead: Recommendations from CDC's Advisory Committee on Childhood Lead Poisoning Prevention. Atlanta, 2007.