

Lead Poisoning—Adults (≥16 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 (BLLs) to determine the case classification ([section 3.B](#)).

For suspect cases:

- For adults, almost all blood draws for lead testing are venous samples. As a result, a patient classified as a suspect case is very rare ([section 4.A](#)).
- Complete the case report form (CRF) in Merlin and report the case.
- Re-assess the case definition after the follow-up test is received ([section 4.A](#)).
 - 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:

For BLLs of 10 to <25 µg/dL ([section 4.C](#))

- Review laboratory report to ensure that complete information was provided.
- Collect demographic and exposure information.
- Update employer information and provide a job description for occupational exposures in Merlin.
- Complete the CRF in Merlin and report the case.
- Mail a letter and provide educational materials to the case.
- Recommend retesting in 6 months.

For BLLs of 25 to <50 µg/dL ([section 4.C](#))

- Review laboratory report to ensure that complete information was provided.
- Collect demographic and exposure information.
- Update employer information and provide a job description for occupational exposures in Merlin.
- Complete the CRF in Merlin and report the case.
- Mail a letter and provide educational materials to the case.
- Notify the health care provider.
- Interview the case.
- Recommend retesting in 1 month.

For BLLs ≥50 µg/dL ([section 4.C](#))

- Review laboratory report to ensure that complete information was provided.
- Collect demographic and exposure information.
- Update employer information and provide a job description for occupational exposures in Merlin.
- Complete the CRF in Merlin and report the case.
- Mail a letter and provide educational materials to the case.
- Notify the health care provider.
- Interview the case.
- If work-related, recommend the person be removed from their work environment.
- For BLLs ≥80 µg/dL, recommend the physician consider chelation therapy.
- Recommend retesting in 2 weeks.

Conclude the Investigation: ([section 4.D](#))

- Medical case closure
- Administrative case closure

Lead Poisoning–Adults (≥16 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 adults in Florida
2. To ensure appropriate and timely follow-up care of adults with elevated BLLs
3. To prevent the occurrence of new cases and worsening illness 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. Confirmed lead poisoning cases must be reported to the Florida Department of Health (DOH) by end of the next business day following 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.

[Top](#)

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

Lead is not an essential element and serves no useful purpose in the body. Exposure to inorganic lead occurs when dust and fumes are inhaled and when lead from lead-contaminated hands, food, water, cigarettes, and clothing is ingested. Recent research demonstrates that multiple health effects can occur at levels once considered safe. Lead absorbed from the respiratory and digestive systems into the blood is distributed to tissues throughout the body. More than 90% of total body lead content eventually accumulates in the bones, where it has a half-life of years to decades. Lead stored in bones continues to be released, via the bloodstream, to tissues throughout the body long after the external environmental exposure has ceased.

Lead affects all organs and functions of the body to varying degrees. The frequency and severity of symptoms among exposed individuals depends upon the amount of exposure. The variation of symptoms that appear in exposed individuals, as well as a growing body of epidemiologic studies, suggest that wide variation exists in individual susceptibility to lead poisoning. Early overt symptoms in adults are often subtle and nonspecific, involving the nervous, gastrointestinal, or musculoskeletal systems. High levels of exposure can result in delirium, seizures, stupor, coma, or lead colic. Other overt signs and symptoms include hypertension, peripheral neuropathy, ataxia, tremor, gout, nephropathy, and anemia. In general, symptoms increase with increasing BLLs.

The “dose” or quantity of lead that a person receives will be determined by the concentration of lead in the air, the amount ingested, and the duration of such exposure. The BLL remains the predominant biological marker used in clinical assessment, workplace monitoring, public health surveillance, and regulatory decisions regarding removal from exposure under the Occupational Safety and Health Association (OSHA) lead standards.

C. Sources of lead exposure

- **Battery manufacturing and recycling:** Battery manufacturing plants are the leading source of occupational lead poisoning cases in Florida. As lead is melted down to create lead batteries, a toxic vapor is created. This vapor is easily inhaled causing lead to enter the bloodstream and be distributed throughout the body. Lead in the form of lead oxide is used in the pasting process in battery manufacturing. Lead oxide can be extremely harmful if ingested or inhaled. Any individual employed by a battery manufacturing or recycling plant should be especially cautious of lead exposure and should always follow safe work practices. By-products from these industries have been linked with elevated BLLs in adults and children.
- **Remodeling and renovation projects:** Residential areas built before 1978 may contain lead-based paint. 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. As of 2012, 36% of Florida homes were built between 1950 and 1979. Sanding and scraping lead-based paint creates airborne lead dust, which is easily inhaled. This is hazardous to the adult performing the work as well as any other family members near the work site. Inhalation or ingestion of lead dust can cause numerous health effects.
- **Ammunition manufacturing:** Lead melts at a reasonably low temperature. This, along with the fact that lead is an extremely durable metal makes it an attractive component used in bullets. Special precautions should be taken when melting lead and molding bullets. The process of melting lead causes a lead vapor, which is extremely poisonous and can be easily inhaled. Melting lead should always occur in a well-ventilated area in the absence of children or pregnant women, as they are most vulnerable to the harmful effects of lead poisoning.
- **Indoor shooting and firing ranges:** Indoor firing and shooting ranges are common sources of adult lead exposure. Workers and shooting hobbyists at indoor firing ranges can be exposed to hazardous lead concentrations and may be at risk for lead exposure and poisoning. Workers are commonly exposed to airborne lead when using ammunition with primers containing lead styphnate or lead bullets. Shooters or anyone in the firing range can be exposed to lead fumes from the "gun smoke" or the lead dust that is released into the air when the gun is fired. Workers can also be exposed to airborne lead dust when cleaning the range and guns or emptying bullet trays.

- Home or folk remedies and cultural practices: Ayurveda medicines or cultural/folk medicines are used to treat a wide spectrum of diseases. Some Ayurveda preparations have been found to contain lead at 100 to 10,000 times greater than acceptable limits. In addition to Ayurvedic medicines, other traditional medicines originating from Asian, Middle Eastern, and Hispanic cultures have been found to contain lead and other heavy metals. Although many health supplements are now subject to limited government regulation in the U.S., these medicines are readily obtainable as herbal remedies in health food stores and through the internet; their safety and efficacy are not regulated by government agencies such as the U.S. Food and Drug Administration. Without sufficient public awareness, the risk of lead poisoning in individuals taking these supplements is quite high.
- Other occupational practices: Occupations associated with automotive repair are also one of the leading sources of lead exposure. The primary source of lead exposure in automotive repair shops is due to lead soldering and welding. These activities create airborne lead dust that is easily inhaled if safe work practices are not followed.

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.

D. At-risk populations

In adults, occupational exposure is the main cause of lead poisoning. Adults are at risk when working in facilities that produce a variety of lead-containing products; these include radiation shields, ammunition, certain surgical equipment, fetal monitors, plumbing, circuit boards, jet engines, and ceramic glazes. In addition, lead miners and smelters, plumbers and fitters, auto mechanics, glass manufacturers, construction workers, battery manufacturers and recyclers, firing range instructors, and plastic manufacturers are at risk for lead exposure. Other occupations that present lead exposure risks include welding, manufacture of rubber, printing, zinc and copper smelting, processing of ore, combustion of solid waste, and production of paints and pigments.

E. Treatment

Primary management for adult lead poisoning is identification of the lead source and cessation of exposure. Chelation therapy is recommended for adults with BLLs ≥ 100 $\mu\text{g}/\text{dL}$ (should also be strongly considered for BLLs of 80 to <100 $\mu\text{g}/\text{dL}$ and possibly considered for BLLs of 50 to <80 $\mu\text{g}/\text{dL}$ in the presence of lead-related symptoms).¹

[Top](#)

3. CASE DEFINITION

A. Clinical description

Chronic exposures are often asymptomatic but may result in arthralgia, headache, weakness, depression, loss of libido, impotence, and vague gastrointestinal difficulties. Late effects may include chronic renal failure, hypertension, gout, and chronic encephalopathy.⁴

B. Laboratory criteria for diagnosis

Confirmatory:

- A Blood lead level of ≥ 10 $\mu\text{g}/\text{dL}$ measured from a venous specimen.
Or
- Blood lead levels of ≥ 10 $\mu\text{g}/\text{dL}$ measured from **two** capillary specimens, unknown specimens (i.e., venous or capillary), or a combination of capillary and unknown test type draws taken **within 12 weeks** of one another.

Supportive:

- A Blood lead level of ≥ 10 $\mu\text{g}/\text{dL}$ measured from a single capillary specimen or unknown specimen (i.e., venous or capillary).

Note: Patients that are a suspect case should be encouraged to obtain a follow-up blood lead test within 12 weeks of the initial test. (It is rare for an adult to receive a capillary blood lead test).

C. Case classification

Confirmed: A person with confirmatory laboratory evidence

OR

Suspect: A person with supportive laboratory evidence

D. Comments:

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 all laboratories and hospitals, and physicians who conduct on-site blood lead analysis, local health department disease investigators should only report **suspect and confirmed cases in Merlin**.

The reportable level of lead poisoning in Florida is the same for adults as for children (see laboratory criteria above). Once an adult has had an initial confirmed BLL test result of ≥ 10 $\mu\text{g}/\text{dL}$, if he or she has additional follow-up test results, regardless of the test type, these results are to be included with initial case information and **not reported** as a new case.

If a woman is pregnant, her BLL should be < 5 $\mu\text{g}/\text{dL}$ from the time of conception throughout pregnancy. **If a pregnant woman's BLL is ≥ 5 $\mu\text{g}/\text{dL}$, refer her to her health care provider.**

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

[Top](#)

4. CASE INVESTIGATION

A. Suspect cases

As mentioned above, for adults, almost all blood draws for lead testing are venous samples. As a result, a patient classified as a suspect case is very rare. When the local health department receives an **initial** elevated blood lead laboratory report (capillary or unknown test type classifying the individual as a suspect case), the designated disease investigator should enter the individual'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 person should be classified as "suspect" and reported in Merlin. Complete and submit the case report form (CRF) in Merlin. Adults with an elevated capillary test or unknown test type (≥ 10 $\mu\text{g}/\text{dL}$) should have a follow-up confirmatory venous test done. 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 $\mu\text{g}/\text{dL}$, then close the case in Merlin.
2. If the follow-up BLL is ≥ 10 $\mu\text{g}/\text{dL}$, conduct the investigation following the guidelines described below.

B. Confirmed cases

When the local health department receives an elevated blood lead laboratory report (classifying the individual as a confirmed case), the designated disease investigator should enter the individual'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 person should be classified as "confirmed" and reported in Merlin. If the person is already in Merlin as a suspect case, then update the status to "confirmed."

Cases should remain 'open' until the case meets the closure criteria (see section 4.D) below.

C. Routine investigation

An investigation should be conducted for confirmed cases of lead poisoning.

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

Note: If a woman is pregnant, her BLL should be < 5 $\mu\text{g}/\text{dL}$ from the time of conception throughout pregnancy. For follow-up testing, please refer to the Centers for Disease Control and Prevention's Guidelines for the Identification and Management of Lead Exposure in Pregnant and Lactating Women available at <http://www.cdc.gov/nceh/lead/publications/leadandpregnancy2010.pdf>.

If a pregnant woman's BLL is ≥ 5 $\mu\text{g}/\text{dL}$, refer her to her health care provider.

- **For BLLs of 10 to < 25 $\mu\text{g}/\text{dL}$:**

1. Report the case in Merlin.
2. Review laboratory report to ensure that complete information was provided. If not, contact the provider and obtain missing information.
3. Collect demographic and exposure information.

4. Mail a letter and provide educational materials to the case.
 5. Update employer information and provide a job description for occupational exposures in Merlin.
 6. Complete and submit the CRF in Merlin.
 7. Recommend the individual be retested by their health care provider within 6 months.
- **For BLLs of 25 to <50 µg/dL:**
 1. Follow the steps indicated for investigation of adults with BLLs of 10 to <25 µg/dL.
 2. Notify the health care provider that the patient will be contacted to obtain additional information about his/her exposure.
 3. Interview the case.
 4. Mail the client a letter and fill out the investigation questionnaire to evaluate the possibility of exposure to “take-home” lead among household members, especially children.
 5. Ask questions that address:
 - Current and past work that involved the use of or exposure to lead
 - Hygiene habits (e.g., hand washing, showering after work and before going home)
 - Smoking status
 - Hobbies
 - Potential “take-home” lead exposure among household members, especially children and pregnant women
 - Parents and caregivers should be encouraged to take children for a blood lead test if they are at risk for “take-home” lead exposures.
 - If a child has an elevated BLL, follow the DOH Lead Poisoning Guide to Surveillance and Investigation among children.
 6. Recommend the individual be retested by their health care provider within 1 month.
 - **For BLLs ≥50 µg/dL:**
 1. Follow the steps indicated for investigation of adults with BLLs of 25 to <50 µg/dL.
 2. According to OSHA, the individual should be removed from their work environment.
 3. For BLLs ≥80 µg/dL, recommend the physician consider chelation.
 4. Recommend the individual be retested by their health care provider within 2 weeks.

Follow-up results: Attach follow-up blood lead test results to existing cases. Contact the provider or patient to determine if the exposure is related to a change in job duty or employment. Document the new employer and job duty information in the case notes, if applicable.

D. Conclude the investigation

There are two reasons to close an adult lead case in Merlin: medical and administrative. When a case is closed in Merlin, investigators are asked to report the reason for closure in the extended case closure section in Merlin.

1. Medical case closure:

- Follow-up BLL is <10 µg/dL.
- For cases with BLL ≥50 µg/dL, if two follow-up BLLs are <40 µg/dL the case can be medically closed and routine screening is recommended.

2. Administrative case closure:

- Client refuses services: Contact with the client is made, but services are refused.

- Unable to locate: The adult lead poisoned individual is unable to be located or is lost to follow-up. There should be at least three documented attempts (two telephone calls and a letter) to contact the individual.
- Out of compliance: Contact is made with the lead poisoned individual, but he/she or the health care provider does not comply with follow-up recommendations.
- Moved out of the state: When this occurs, please indicate the state where the individual relocated. The investigator can then transfer the person to the appropriate state health department.
- Other: The investigator may select “other” if the case needs administrative closure for a reason different from listed above. Provide a short description in the comments section if “other” is selected.

[Top](#)

5. ROUTINE PREVENTION

With appropriate engineering controls, safe work practices, and personal protective equipment, workers without a previous history of substantial lead exposure should be able to work with lead in a manner that minimizes the potential for hazardous levels of exposure. Exposure control measures that can be implemented and/or improved to reduce employee BLLs include:

- Substitution of lead-free materials and work processes
- Use of engineering controls such as local exhaust ventilation and safe work practices
- Good hygiene and decontamination practices to limit ingestion and the risk of take-home lead
- Use of personal protective equipment (PPE) such as protective clothing and respirators

[Top](#)

6. IMPORTANT LINKS

A. Florida Department of Health (DOH)

<http://www.floridahealth.gov/healthy-environments/lead-poisoning/adults.html>

B. Centers for Disease Control and Prevention (CDC)

<http://www.cdc.gov/niosh/topics/ables/ables.html>

C. Environmental Protection Agency (EPA):

<http://www2.epa.gov/lead>

D. Occupational Safety and Health Administration (OSHA):

https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=10030

[Top](#)

7. REFERENCES

- A. Kosnett Michael J, Wedeen Richard P, Rothenberg Stephen J, Hipkins Karen L, Materna Barbara L, Schwartz Brian S, Hu Howard, and Woolf Alan. *Recommendations for Medical Management of Adult Lead Exposure*.
- B. Gunturu Krishna S ,Nagarajan , Priyadharsini, McPhedran Peter, Goodman Thomas R, Hodsdon Michael E and Strout Matthew P. *Ayurvedic herbal medicine and lead poisoning*. Journal of Hematology and Oncology 2011 4:51.
- C. ASTDR Lead Toxicity: *What Are The Physiological Effects of Lead?* Retrieved August 20, 2012.

- D. Staudinger Kevin C, Roth Victor S. *Occupational Lead Poisoning*. American Family Physician. 1998 February 15; 57(4): Pages: 719-726.
- E. NIOSH 2009. *Preventing Exposures to Lead and Noise at Indoor Firing Ranges*.

[Top](#)