

Elevated Blood Lead

Important Notice:

All public health recommendations for routine investigations are based on “Control of Communicable Diseases Manual, 20th edition, 2015” (CCDM) unless otherwise stated. Use the CCDM as the primary resource for case investigations that meet routine follow up. In cases of complicated situations or unique issues not addressed by this manual, please refer to the Administrative Rules of Montana (ARM) Chapter [37.114](#) or contact the designated subject matter expert in the Office of Epidemiology and Scientific Support at the Montana DPHHS for further clarification.

PROTOCOL CHECKLIST

- Confirm diagnosis, see case definition (see section 3.3 and 4.1)
- Review background information on elevated blood lead (see section 2)
- Contact provider to determine a plan to re-test blood lead level
- Notify state health department of the case by entering available information into the Montana Infectious Disease Information System (MIDIS), if available, within the time frame for the specific disease per (ARM) [37.114.204](#) (see section 1.3)
- Review for use, specific technical assistance guidance documents ([See the CDEpi Resources Page](#))
- Interview patient/guardian, cover the following:
 - Review health consequences of an elevated blood lead facts with patient/guardian (see section 2.2)
 - Ask about exposures to relevant risk factors and to determine the risk of exposure for other household members (see section 4.3)
 - Educate patient/ guardian on lead exposure prevention (see section 6)
 - Implement Control Measures (see section 5.1)
 - Address patient’s/guardian’s questions or concerns
 - Determine answers to “condition specific” questions at the end of each MIDIS investigation
- Follow-up on special situations (see section 5, review references and additional information or contact the Epidemiology and Scientific Support Bureau at 406-202-8866)
- Attach any additional lab reports to case investigation in MIDIS
- When done with MIDIS investigation, close the investigation.

1 DISEASE REPORTING

1.1 Provider notification to Public Health Authorities

Any person, including, but not limited to a physician, dentist, nurse, medical examiner, other health care practitioner, administrator of a health care facility or laboratory, public or private school administrator, or laboratory professional who knows or has reason to believe that a case exists of a reportable disease or condition defined in the Administrative Rules of Montana (ARM) [37.114.203](#) must immediately report to the local health officer.

For more information on analysis and specimen collection please contact the laboratory conducting the test or the Montana Public Health Laboratory (MTPHL) at 1-800-821-7284. The MTPHL Laboratory Services Manual can be accessed <https://dphhs.mt.gov/publichealth/LaboratoryServices/PublicHealthLabTesting>

1.2 Local Health Department Follow-up Responsibilities

Immediately after being notified of a case of a reportable condition, a local health officer must investigate per (ARM) [37.114.546](#) and [37.114.205](#). See section 4.3 below.

1.3 Local Health Department Reporting to State Public Health Authorities

Toxic Metals exposures involving Lead (Pb), Arsenic (As), Cadmium (Cd), or Mercury (Hg) greater or equal the State reference value per REPORTABLE DISEASES AND CONDITIONS [ARM 37.114.203\(1\)\(e\), \(i\), \(ai\), and \(ar\)](#) must be reported to DPHHS regardless of patient age.

Per [ARM 37.114.204 2\(a\) and 2\(b\)](#), those who are named as required reporters including laboratories, local health officer, and other health practitioners in [ARM 37.114.201](#) should notify DPHHS of a known or suspected case of Lead Poisoning within 24 hours of learning of the condition. The local health jurisdiction must complete the case investigation involving Lead Poisoning within seven (7) days of starting the case investigation.

In October 2021, CDC updated the BLRV to 3.5 micrograms per deciliter ($\mu\text{g}/\text{dL}$). Pending in 2022, the REPORTABLE DISEASES AND CONDITIONS [ARM 37.114.203](#) will reflect the CDC revised BLRV and require:

- Clinical laboratories to report ALL venous blood lead tests regardless of test result and patient age;
- Clinical laboratories and Point of Care (i.e., LeadCare II) testing sites to report ALL capillary blood lead tests greater or equal, $\geq 3.5 \mu\text{g}/\text{dL}$ for children and youth ages less than 16 years.

While the CDC has lowered the BLRV to 3.5 $\mu\text{g}/\text{dL}$, under State jurisdiction the requirements for reporting and investigations are still based on the 5 $\mu\text{g}/\text{dL}$ BLRV until the Montana Administrative Rule ([ARM 37.114.203](#)) on REPORTABLE DISEASES AND CONDITIONS for Lead Poisoning is updated pending in Summer 2022. During the interim, DPHHS recommends that health jurisdictions conduct follow-up activities for blood lead tests $\geq 3.5 \mu\text{g}/\text{dL}$ that are reported or known by health officials within your jurisdiction. We recognized that early adoption of the revised CDC BLRV may vary by jurisdiction.

2 THE DISEASE AND ITS EPIDEMIOLOGY

2.1 Public Health Significance in Montana

In September 2021, the Montana Department of Health and Human Services (DPHHS) was awarded funding through a cooperative agreement with the Centers for Disease Control and Prevention (CDC) to support secondary prevention strategies for childhood lead poisoning prevention and surveillance including ensuring blood lead testing and reporting, enhancing blood lead surveillance, and improving linkages to recommended services. The Childhood Lead Poisoning Prevention Program (CLPPP) Team at MT DPHHS provides technical assistance on child blood lead testing, reporting, surveillance planning and program evaluation through agencies and healthcare providers serving children, to ensure that a comprehensive system of identification, referral, follow-up, and evaluation is in place for children exposed to lead.

Nationally, childhood lead poisoning is a major, preventable environmental health problem. According to the CDC, at least four million households have children living in them that are exposed to high levels of lead. There are approximately half a million U.S. children ages 1–5 years with blood lead levels above 5 µg/dL, the reference level at which CDC recommends public health actions be initiated. The CDC publishes state surveillance data for 33 states; Montana data will be available in 2022.

The National Toxicology Program (NTP) concluded in 2012 that after reviewing the primary epidemiological literature regarding low-level lead exposure the evidence provides support for adverse health effects in both children and adults at blood lead levels below 10 µg/dL, and for some effects, below 5µg/dL. There is no safe level of lead in blood. Even low levels of lead in blood have been shown to affect a child’s learning capacity, ability to pay attention, and academic achievement. The effects of lead exposure can be permanent. The most important action that parents, doctors, and others can take is to prevent lead exposure before it occurs.

2.2 Clinical Description of Illness

According to the CDC, lead poisoning often occurs with no obvious symptoms and frequently goes unrecognized. Lead poisoning can cause learning disabilities, behavioral problems, and, at very high levels, seizures, coma, and even death.

The effects of lead are the same whether it enters the body through breathing or swallowing. Lead can affect almost every organ and system in your body. The main target for lead toxicity is the nervous system, both in adults and children. Long-term exposure of adults can result in decreased performance in some tests that measure functions of the nervous system. It may also cause weakness in fingers, wrists, or ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people and can cause anemia. Exposure to high lead levels can severely damage the brain and kidneys in adults or children and ultimately cause

death. In pregnant women, high levels of exposure to lead may cause miscarriage. High-level exposure in men can damage the organs responsible for sperm production.

Small children can be exposed by eating lead-based paint chips, chewing on objects painted with lead-based paint, or swallowing house dust or soil that contains lead.

Children are more vulnerable to lead poisoning than adults. A child who swallows large amounts of lead may develop blood anemia, severe stomachache, muscle weakness, and brain damage. If a child swallows smaller amounts of lead, less severe effects on blood and brain function may occur. Even at much lower levels of exposure, lead can affect a child's mental and physical growth.

Exposure to lead is more dangerous for young and unborn children. Unborn children can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies, and decreased mental ability in the infant, and learning difficulties and reduced growth in young children. These effects are more common if the mother or baby was exposed to high levels of lead. Some of these effects may persist beyond childhood.

3 CASE DEFINITION

3.1 Clinical Description

See Section 2.2.

3.2 Laboratory Criteria for Diagnosis

Confirmed

- A single venous blood sample ≥ 5 $\mu\text{g}/\text{dL}$ OR two capillary blood specimens, drawn within 12 weeks of each other, both ≥ 5 $\mu\text{g}/\text{dL}$ if the cases' age is less than 16 years.
- A single venous blood sample ≥ 5 $\mu\text{g}/\text{dL}$ if the case is ≥ 16 years of age.

3.3 Case Classification

Confirmed

- A case with confirmatory laboratory test results for elevated blood lead (BLL ≥ 5 $\mu\text{g}/\text{dL}$).

Unconfirmed

- A single capillary or unknown blood specimen with elevated lead concentration OR two capillary blood specimens, drawn greater than 12 weeks apart, both with elevated lead concentration.

Probable or Suspect

There is no probable or suspect case classification.

Comment

Confirmed cases in children less than 16 years of age are only counted once per year, regardless of the number of elevated blood lead levels in the same year. Only the highest blood lead level for that case in that year is counted. A new adult case is an adult with elevated lead in the current calendar year, but who did not have an elevated lead level in the immediately preceding calendar year. In October 2021, CDC updated the BLRV to 3.5 micrograms per deciliter ($\mu\text{g}/\text{dL}$). The (ARM) [37.114.546](#) will reflect the CDC revised BLRV pending in 2022. See Section 1.3.

4 ROUTINE CASE INVESTIGATION

In accordance with (ARM) [37.114.314](#) conduct an epidemiologic investigation to determine the source and possible lead exposure risks. Refer to the CDC for additional resources related to lead investigation. Determine the information necessary to complete the investigation in MIDIS ([See instructions at CD Epi resources](#))

4.1 Confirm the Diagnosis

Review the laboratory results to confirm the diagnosis. Clinical signs and symptoms are not necessary to confirm elevated blood lead levels.

4.2 Laboratory Requirements

See Sections 1.1 and 1.2.

4.3 Case Investigation

The public health recommendations for this investigation guideline are based on the ARMs and CDC rather than the CCDM.

Specific Control Measures

Per ARM [37.114.546](#), “The health officer must gather information about the circumstances and nature of the exposure using forms developed by the department ([See CD Epi Exposure Questionnaire](#)). The local health officer must ensure that the following actions are performed when a blood lead level ≥ 5 micrograms per deciliter ($\mu\text{g}/\text{dL}$) is reported. The health officer or health-care provider must provide:

- (a) Counseling about health consequences of lead poisoning;
- (b) Information about ways to eliminate lead exposure; and
- (c) Referral of the case and household members potentially at risk of exposure to a health-care provider for additional follow-up and blood-lead testing as appropriate.

4.4 Contact Investigation

Because environmental/occupational lead exposures are ubiquitous and may affect entire families, it should be noted in any individual investigation whether there are additional family members at risk of exposure to lead. If so, those family members should be evaluated for elevated blood lead levels. This applies particularly to pregnant women and young children.

4.5 Environmental Evaluation

See Sections 1.2 and 4.3(b). Conduct an environmental evaluation if an ongoing source of exposure is suspected ([See CD Epi Exposure Questionnaire](#)).

5 CONTROL MEASURES

In accordance with (ARM) [37.114.501](#), utilize the prevention measures indicated in Section 6.2 for this disease. Contact the Epidemiology and Scientific Support Bureau for consultation and questions at 406-202-8866.

5.1 Case Management

See Section 1.2.

5.2 Contact Management

See Section 4.4.

5.3 Environmental and Occupational Measures

An environmental evaluation is appropriate if an ongoing source of exposure is not identified or if more than one case is associated with a venue, such as an occupational setting. Contact the MT Childhood Lead Poisoning Prevention Program (CLPPP) at DPHHS for technical assistance with conducting environmental evaluation at 406-202-8866 or 406-444-7560.

Depending on the situation, Department of Labor and Industry (DLI) may assist with environmental investigations of public entities and the Occupational Safety and Health Administration (OSHA) may assist with private and federal entities. The Billings MT OSHA contact is Art Hazen at 406-247-7494. A public entity is defined as any state or local government or any department, agency, special purpose district, or other instrumentality of one or more state or local governments. Contact Department of Labor and Industry (DLI) with any questions about public entities at 406-444-6543.

The employee should work with their employer to complete a First Report of Injury. The employer is then required to submit the form to the company's worker's compensation insurer. The insurer will determine whether the injury or occupational disease is work-related and compensable. However, if the employee has issues working with their employer to receive compensation, they can contact the DLI at 406-444-6543 or visit their website for more information and resources <http://erd.dli.mt.gov/work-comp-claims>.

5.4 Lead testing and screening in newly arrived refugees.

The CDC recommends lead testing all international refugees, immigrants, or asylum seekers upon arriving in the United States due to their higher risk for environmental lead poisoning linked to many sources and products common to their country of origin or hazards encountered after arriving to their new home. See the [CDC resources](#) for a list of many of the country specific consumer products contaminated with lead such as traditional remedies, herbal supplements, spices, candies, cosmetics (i.e., kajal or khol), and jewelries or amulets. Country of origin, country of last residence, and age are strong predictors of elevated blood lead levels among newly arrived refugee children. Specific testing and follow-up guidelines are given for children \leq 16 years of age, youth $>$ 16 years of age, and pregnant and lactating women and girls in the [CDC resources](#).

6 ROUTINE PREVENTION

6.1 Immunization Recommendations

N/A

6.2 Prevention Recommendations

CDC states that “lead poisoning is entirely preventable. The key is stopping children [and adults] from coming into contact with lead and treating children [and adults] who have been poisoned by lead.

Because lead can cause damage without overt symptoms, monitoring blood lead levels through evidence-based surveillance methods is a vital part of lead poisoning prevention. This is especially important in ‘at-risk’ groups such as Medicaid recipients and employees exposed to lead through work. People who re-load shell casings (i.e., ammunitions) or create stained glass are also likely to have high exposures to lead.

Common sources of lead poisoning include soil and dust contaminated with lead paint, leaded gasoline, or industrial or occupational lead, drinking water contaminated at home or school from lead in service lines, plumbing or fixtures, occupations, hobbies, improperly fired ceramic ware, and imported candy and canned food (sealed with lead).

If exposure is through lead paint, instruct them to clean hard surfaces with water regularly (using a mop or cloth). Sweeping will not effectively remove the lead and in fact will bring it into the air making it more likely to be absorbed into the lungs.

A diet rich in calcium, vitamin C, and iron will reduce the absorption and effects of lead.

Adults with occupational exposure are reminded to always use safety equipment as directed and talk with employer regarding proper use of equipment. Be sure to wash hands and change out of work clothes when finished with work. If elevated blood lead levels persist, then consider removal from source at work via re-assignment. OSHA mandated occupational control measures begin at blood lead levels equal to or above 40 micrograms per deciliter ($\mu\text{g}/\text{dL}$) or two blood lead levels greater or equal to 20 micrograms per deciliter ($\mu\text{g}/\text{dL}$) measured 6 months apart.

Less common sources of lead are described here:

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

Prevention guidance in a factsheet for parents

<https://www.cdc.gov/nceh/lead/docs/5things-508.pdf>

A more exhaustive list of potential sources of lead poisoning can be found in the Appendix in this document: <http://www.cdc.gov/nceh/lead/casemanagement/managingEBLLs.pdf>

US Environmental Protection Agency Education and Outreach materials: *Lead Awareness in Indian Country: Keeping our Children Healthy!* at: <https://www.epa.gov/lead/tribal-lead-curriculum>

7 ESCALATION/ACTIVATION OF EMERGENCY OPERATIONAL PLANNING

These investigation guidelines are designed to assist local health jurisdictions in the steps and actions needed to report, investigate and control reported cases of Lead Poisoning. In the event individual case investigations or other reported cases lead to a cluster of cases by person, time, and place, local health jurisdictions need to contact DPHHS under the Administrative Rules of Montana 37.114.314 and 37.114.315 so DPHHS can consider emergency operational escalation or activation under the Communicable Disease Annex to the DPHHS Emergency Operation Plan.

7 ACKNOWLEDGEMENTS

We would like to acknowledge the Washington, Kansas, Oregon and Florida State Departments of Health and the Centers for Disease Control and Prevention (CDC) for developing the format and select content of this document.

8 REFERENCES AND ADDITIONAL INFORMATION

Important references:

- President's Task Force on Environmental Health Risks and Safety Risks to Children <https://ptfceh.niehs.nih.gov/activities/lead-exposures/index.htm>
- CDC Lead Website
- <http://www.cdc.gov/nceh/lead/>
- Screening for Lead during the Domestic Medical Examination for Newly Arrived Refugees. 2022. <https://www.cdc.gov/immigrantrefugeehealth/guidelines/lead-guidelines.html#recommendations>
- ATSDR CSEM Lead Toxicity. <http://www.atsdr.cdc.gov/csem/lead/docs/lead.pdf>
- Montana General Information Manual for Medicaid Providers. 2020. Lead testing and screening. <https://medicaidprovider.mt.gov/manuals/generalinformationforprovidersmanual>
- CDC Recommendations for Blood Lead Screening of Medicaid-Eligible Children Aged 1–5 Years: Updated Approach to Targeting a Group at High Risk. 2009. <https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5809a1.htm>
- *MANAGEMENT OF CHILDHOOD LEAD EXPOSURE*. Pediatric environmental Health Specialty Units (PEHSU). 2021. <http://www.cdc.gov/nceh/lead/publications/screening.htm>
- *Summary of Recommendations for Follow-up and Case Management of Children Based on Confirmed* Blood Lead Levels*. CDC April 26, 2022. https://www.cdc.gov/nceh/lead/acclpp/actions_blls.html
- *Managing Elevated Blood Lead Levels Among Young Children: Recommendation from the Advisory Committee on Childhood Lead Poisoning Prevention*. CDC. 2002. http://www.cdc.gov/nceh/lead/casemanagement/casemanage_main.htm
- *Low Level Lead Exposure Harms Children: A Renewed Call for Primary Prevention*. CDC. 2012. http://www.cdc.gov/nceh/lead/acclpp/blood_lead_levels.htm

- Mayo Clinic Lead Poisoning Website <http://www.mayoclinic.org/diseases-conditions/lead-poisoning/basics/definition/con-20035487>

Resources for Adult Cases

- “Overlooked: Thousands of Americans Exposed to Dangerous Levels of Lead in Their Jobs” For workers with elevated lead. Scientific American article
<http://www.scientificamerican.com/article/overlooked-thousands-of-american-exposed-to-dangerous-levels-of-lead-in-their-jobs/>
- “Lead and your Health” NIH article for people with elevated lead levels
https://www.niehs.nih.gov/health/materials/lead_and_your_health_508.pdf
- Recommendations for Medical Management of Adult Lead Exposure: Article for providers
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1849937/>
- Medical Management Guidelines for Lead-exposed adults revised 2007: for Providers to manage adults with elevated lead levels
<https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/OLPPP/Pages/medguidelines.aspx>