Elevated Blood Lead

Important Notice:
*All public health recommendations for routine investigations are based on "Control of Communicable Diseases Manual, 19th edition, 2008" (CCDM) unless otherwise stated. Use the CCDM as 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 at Communicable Disease Epidemiology section 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 plan to re-test blood lead level
- ☐ Notify state health department of 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 SharePoint →CDEpi →CDEpi Technical Guidance [Diseases A to Z] → Lead → Guidance Documents)
- ☐ 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 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/parent'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 CDEpi at 406-444-0273)
- ☐ 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/PublicHealthLabTestingl

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**. See section 4.3 below.

1.3 Local Health Department Reporting to State Public Health Authorities

Elevated blood lead levels ≥5 µg/dL must be reported to DPHHS within seven days regardless of age or source of blood.

2 THE DISEASE AND ITS EPIDEMIOLOGY

2.1 Public Health Significance in Montana

In order to assess the extent to which the National Health and Nutrition Examination Survey (NHANES) data reflect the lead exposure experience of Medicaid enrolled children in Montana, the DPHHS Healthy Homes and Lead Poisoning Prevention Program (HHLPPP), in conjunction with nine local health departments conducted a field study in 2012. Consistent with the NHANES data, 3% of these Montana children had BLL ≥5 µg/dL.

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 is not one of them.

The National Toxicology Program (NTP) concluded in 2012 that after reviewing the primary epidemiological literature regarding low-level lead exposure there is sufficient evidence that blood lead levels <10 mcg/dl and <5 mcg/dl are associated with adverse health effects in children and adults. A major strength of the adverse health effects is derived from the

consistency across a wide range of health outcomes across major physiological systems that were evaluated using different methods and techniques.

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, much 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, 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 µg/dL OR two capillary blood specimens, drawn within 12 weeks of each other, both ≥5 µg/dL if the cases age is less than 16 years.

3.3 Case Classification

Confirmed

• A case with confirmatory laboratory test results for elevated blood lead.

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.

Comment(s)

There is no probable or suspect case classification.

Confirmed cases in children aged 16 years or less 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.

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.

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. The local health officer must ensure that the following actions are performed when a blood lead level ≥ five micrograms per deciliter 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.

Lead Poisoning MIDIS Investigations

1. Will "lead poisoning" investigations be included in my quarterly ("completeness") reports?
    a. Yes but open cases do not impact your statistics.
2. What should I do when I see a lab result for elevated blood lead in my queue?
    a. If the lab result is <5 µg/dL – MARK AS REVIEWED, unless it can be associated with a previous investigation
    b. If the lab result is ≥5 µg/dL – OPEN AN INVESTIGATION, or associate it with an investigation
3. When can an investigation be closed?
    a. Close an investigation when all MIDIS elements from the below table are completed after phone calls are made after first elevated blood lead level has been detected.
4. What are the required/recommended data elements to include in the MIDIS investigation?
    a. Please complete the following MIDIS fields as directed in the below table. Abstract the information from the lead form and enter it into MIDIS.
5. Determine the reason for the lead test and classify this in MIDIS as the Method of Confirmation.
    a. Was the test part of the surveillance program for exposed workers?
        i. Most likely among someone with age over 16
        ii. Ordering physician and facility usually located outside of Montana
        iii. Classify the method of confirmation as Occupational disease surveillance
    b. Was this a child under age 5 that was tested for Head start or as part of the well child visit? (Screening purposes)
        i. Classify the method of confirmation as Active Surveillance
    c. Was this person tested due to known exposure through a hobby or an isolated, unique event to that one person?
        i. e.g. Case has a hobby of recasting bullets, or making stained glass windows, or going to the firing range, or working with lead contaminated clay, or refinishing old furniture
        ii. e.g. Case eats often from imported pottery bowl, or imported canned food, or uses traditional remedies
        iii. Classify the method of confirmation as Other
    d. Was this person tested because of exposure to an old building?
        i. e.g. Person tested who lives in an building that has old paint
        ii. Classify the method of confirmation as Case/Outbreak Investigation
    e. Was this person referred for testing because of a *passively* transmitted shared exposure with another case (akin to secondary smoke)?

i. e.g. Family members of someone who comes in the house with lead on their clothing obtained from work or a hobby
ii. Classify the method of confirmation as Epidemiologically Linked

f. Was this person tested because of the *same shared exposure* with another case?
i. e.g. Children at a daycare center that has been identified as the source of lead for a case
ii. e.g. Other adults who do a hobby in the same location as a case
iii. e.g. Family members of a case who live in the same house with old paint
iv. e.g. Community members who drank lead contaminated water
v. Classify the method of confirmation as Case/Outbreak Investigation

g. Was this child tested because of their tendency to eat non-food items beyond what is typical for that age?
i. Physician diagnosis of parental mention of Pica
ii. e.g. eating the remote control unit or bullets
iii. Classify the method of confirmation as Clinical Diagnosis

These definitions are ONLY for Lead investigations and probably differ for other types of investigations.

Section in MIDIS	Field Name	Description
Investigation Summary	Investigation Start Date	Date of first activity to determine source of lead (date of first phone call to person or provider)
	Investigation Status	Closed o All components of investigation are completed Open o One or more component of investigation are not completed
Clinical	Physician	Ordering or primary care physician name and phone number. Usually the one spoken to regarding re-testing and education. If occupational disease surveillance, this is an optional field.
	Condition: Diagnosis Date	Date of first elevated BLL
Epidemiologic	Confirmation Method Choose One	Occupational disease surveillance o For employee monitoring due to working with lead Case/Outbreak Investigation o For investigations of exposures from old houses or environmental contamination (remodeling, lead in drinking water, daycare center, etc.) Epidemiologically Linked o For those accidently exposed from house hold members that carried lead into the house on clothes (from work or a hobby) Active Surveillance o For community testing (Kids tested as part of Head Start or Medicaid screening or adult without any known exposure) Other

		○ For exposures due to hobby or accidental one time exposures (Stain glass hobby, sanding lead paint off furniture) ○ Fully document this exposure in "Exposure Comments" field Clinical Diagnosis (not-lab confirmed) ○ For people with pica (an eating disorder where person ingests objects that are not food) ○ Even if the person lives in a house undergoing renovation or drinks lead infused water
	MMWR Week	MMWR Week in which Diagnosis Date occurred for the MMWR Year
	MMWR Year	MMWR year in which Diagnosis Date occurred
Condition Specific Custom Fields	Ordering Physician Contacted	Yes ○ Phone contact made. Discussion of lead health effects, re-testing schedule, and process to eliminate and reduce exposure. Offer to answer questions. ○ If Occupational Disease Surveillance then discussion must be with the case and not the Ordering Physician. No ○ Did not meet the criteria for yes
	Re-testing schedule been determined	Yes ○ Physician, parent or case can state the next recommended testing date at the end of the conversation and is willing to do re-testing at that time No ○ After discussion, re-testing date cannot be agreed upon or person is reluctant to get re-tested
	Any other household members that could benefit from testing	Yes ○ If children at home exposed though the lead present on the cases clothing or the common source within the community or home (Lead stuck to clothing and worn into the house or renovation where children live, or contaminated well water for the house) No ○ Others in household are very unlikely to be exposed or no one else in the household
	Exposure Comments	Provide detailed notes of conversation ○ Date of conversations ○ Source of lead (If occupational, then Employer Name, City of work, and type of business or exposure method if not evident) ○ Anticipated Re-testing date ○ Interest of person to reduce lead levels ○ Methods to be used to reduce lead exposure ○ Materials provided to provider or patient (if any) (If the source of lead cannot be determined, then describe the process to determine the source and document the progress on finding the source. Once determined, complete the information above.)

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.

5 CONTROL MEASURES

In accordance with (ARM) **37.114.501**, utilize the control measures (prevention tips) indicated in Section 6.2 for this disease. Contact DPHHS CDEpi for consultation and questions at 406-444-0273.

5.1 Case Management

See Section 1.2.

5.2 Contact Management

See Section 4.4.

5.3 Environmental 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.

Depending on the situation, Department of Labor and Industry (DLI) and/or Occupational Safety and Health Administration (OSHA) may assist (private, invitation only) or lead (state buildings) environmental investigations. Contact CDEpi with any questions at 406-444-0273.

5.4 Special Circumstances

See Section 4.3b

6 ROUTINE PREVENTION

6.1 Immunization Recommendations

N/A

6.2 Prevention Recommendations

CDC states that "[l]ead 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, the best prevention is monitoring blood lead levels. 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 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 plumbing or fixtures, occupations, hobbies, improperly fired ceramic ware, and imported 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 good diet 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 dl or two blood lead levels greater or equal to 20 micrograms per dl measured 6 months apart.

Less common sources of lead are described here:
http://www.cdc.gov/nceh/lead/publications/books/plpyc/Chapter3.htm

For cases with a very high lead level, prevention advice can be found here:
http://www.cdc.gov/nceh/lead/publications/books/plpyc/Chapter8.htm

A more exhaustive list of potential sources of lead poisoning can be found in Appendix 1 in this document: http://www.cdc.gov/nceh/lead/casemanagement/managingEBLLs.pdf

General CDC prevention tips can be found at:
http://www.cdc.gov/nceh/lead/tips.htm

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

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8 REFERENCES AND ADDITIONAL INFORMATION

Important references:

A. CDC Lead Website
http://www.cdc.gov/nceh/lead/
B. ATSDR CSEM Lead Toxicity
http://www.atsdr.cdc.gov/csem/lead/docs/lead.pdf
C. *Screening Young Children for Lead Poisoning: Guidance for State and Local Public Health Officials*. CDC. 1997.
http://www.cdc.gov/nceh/lead/publications/screening.htm
D. *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
E. *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
F. Mayo Clinic Lead Poisoning Website
http://www.mayoclinic.org/diseases-conditions/lead-poisoning/basics/definition/con-20035487
G. Screening Young Children for Lead Poisoning, Chapter 4 Role of Child Health-Care Providers in Childhood Lead Poisoning Prevention
http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0ahUKEwiokOrd_dzNAhUB5mMKHcUFAaMQFggiMAE&url=http%3A%2F%2Fwww.letsmakeleadhistory.org%2FLinkClick.aspx%3Flink%3Dchapter4%2BHealthcare%2B8-16-06.pdf%26tabid%3D110&usg=AFQjCNExYk-Btu1hfeS-mnQcqo5U-WuZ5A&bvm=bv.126130881,d.cGc

Resources for Adult Cases

A. "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/
B. "Lead and your Health" NIH article for people with elevated lead levels
https://www.google.com/search?q=lead+and+your+health+nih+2013&rls=com.microsoft:en-US:IE-Address&ie=UTF-8&oe=UTF-8&sourceid=ie7&gws_rd=ssl
C. Recommendations for Medical Management of Adult Lead Exposure: Article for providers
http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1849937/
D. Medical Management Guidelines for Lead-exposed adults revised 2007 : for Providers to manage adults with elevated lead levels
http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwjLgYb2_NzNAhUDzmMKHQqnDLgQFgglMAA&url=http%3A%2F%2Fwww.aoec.org%2Fdocuments%2Fpositions%2FMMG_FINAL.pdf&usg=AFQjCNHRm-JMMrx4pg2pyY6bmWRgL9w0BQ