MAYO CLINIC LABORATORIES

Test Definition: PBDV

Lead, Venous, with Demographics, Blood

Overview

Useful For

Detecting lead toxicity in venous blood specimens

Profile Information

Test Id	Reporting Name	Available Separately	Always Performed
PBBV	Lead, Venous, B	No	Yes
DEMO8	Patient Demographics	No	Yes

Special Instructions

- Lead and Heavy Metals Reporting
- Metals Analysis Specimen Collection and Transport
- Lead and Heavy Metals Reporting-Spanish

Method Name

Inductively Coupled Plasma Mass Spectrometry (ICP-MS)

NY State Available

Yes

Specimen

Specimen Type

Whole blood

Ordering Guidance

If testing is needed on a capillary specimen, order PBDC / Lead, Capillary, with Demographics, Blood.

Specimen Required

Patient Preparation: High concentrations of gadolinium and iodine are known to potentially interfere with most inductively coupled plasma mass spectrometry-based metal tests. If either gadolinium- or iodine-containing contrast media has been administered, a specimen should not be collected for 96 hours.

Supplies:

-Metal Free B-D Tube (EDTA), 6 mL (T183)

-Metal Free B-D Tube (EDTA), 3 mL (T989)

Container/Tube:

Preferred: Royal blue-top BD Vacutainer Plus with EDTA (6 mL) blood collection tube

Acceptable: Royal blue-top BD vacutainer with EDTA blood collection tube (3 mL)

Specimen Volume: 2 mL

Collection Instructions:

1. See Metals Analysis Specimen Collection and Transport for complete instructions.
2. Send whole blood specimen in original tube. **Do not aliquot.**

Forms

1. Lead and Heavy Metals Reporting (T491) or Lead and Heavy Metals Reporting-Spanish (T956)
2. If not ordering electronically, complete, print, and send a General Request (T239) with the specimen.

Specimen Minimum Volume

0.1 mL

Reject Due To

Gross hemolysis	OK
Gross lipemia	OK
Gross icterus	OK
Clotted blood	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Whole blood	Refrigerated (preferred)	28 days	
	Ambient	28 days	
	Frozen	28 days	

Clinical & Interpretive

Clinical Information

Lead is a heavy metal naturally found in the environment that can be an acute and chronic toxin. Lead can enter the environment through releases from mining lead and other metals, and from factories that make or use lead, lead alloys, or lead compounds. Lead is released into the air during burning coal, oil, or waste. Before the use of leaded gasoline in motor vehicles was banned (January 1, 1996), most of the lead released into the United States environment came from vehicle exhaust.

Lead was banned from household paints in 1978 but is still found in paint produced for nondomestic use and in artistic pigments. Ceramic products available from noncommercial suppliers (such as local artists) often contain significant amounts of lead that can be leached from the ceramic by weak acids, such as vinegar and fruit juices. Lead is commonly found in soil especially near roadways, older houses, old orchards, mining areas, industrial sites, near power plants, incinerators, landfills, and hazardous waste sites. Recent data has shown that inexpensive cosmetic jewelry pieces sold to the general public may contain high levels of lead, which can be transferred to the skin through routine handling. However, not much lead can get into your body through your skin.

People may be exposed to lead by eating food or drinking water that contains lead. Drinking (tap) water in houses

containing lead pipes may contain lead, especially if the water is acidic or "soft". Foods may contain small amounts of lead. Leafy fresh vegetables grown in lead-containing soils may have lead-containing dust on them. Lead may also enter foods if they are put into improperly glazed pottery or ceramic dishes and from leaded-crystal glassware. However, since lead solder is no longer used in cans, very little lead is typically found in food.

The typical diet in the United States contributes 1 to 3 mcg of lead per day, of which 1% to 10% is absorbed; children may absorb as much as 50% of the dietary intake, and the fraction of lead absorbed is enhanced by nutritional deficiency. The majority of the daily intake is excreted in the stool after direct passage through the gastrointestinal tract. While a significant fraction of the absorbed lead is incorporated into bone (approximately 94% adults; approximately 73% children) and erythrocytes, lead ultimately distributes among all tissues, with lipid-dense tissues such as the central nervous system being particularly sensitive to organic forms of lead. All absorbed lead is ultimately excreted in the bile or urine. Soft-tissue turnover of lead occurs within approximately 120 days.

Other alternative sources of lead include moonshine distilled in lead pipes, some traditional home medicines, non-Western cosmetics (eg, surma and kohl), and some types of hair colorants, cosmetics, and dyes.

Lead expresses its toxicity by several mechanisms:
1) It avidly inhibits aminolevulinic acid dehydratase and ferrochelatase, 2 of the enzymes involved in the synthesis of heme. In the end, this inhibition causes decreased hemoglobin synthesis resulting in anemia.
2) Lead is also an electrophile that avidly forms covalent bonds with the sulfhydryl group of cysteine in proteins. Thus, proteins in all tissues exposed to lead will have lead bound to them. The most common sites affected are epithelial cells of the gastrointestinal tract and epithelial cells of the proximal tubule of the kidney.

Avoidance of exposure to lead is the treatment of choice. However, chelation therapy is available to treat severe disease and may be necessary especially in children if the blood lead is higher than 25 mcg/dL. The standard chelating agents currently in use are dimercaprol (British Anti-Lewisite), CaNa2-EDTA (or EDTA), penicillamine, and 2,3-dimercaptosuccinic acid (DMSA; succimer).

Reference Values

<3.5 mcg/dL
Critical values
Pediatrics (< or =15 years): > or =20.0 mcg/dL
Adults (> or =16 years): > or =70.0 mcg/dL

Interpretation

No safe blood lead level in children has been identified. Lead exposure can affect nearly every system in the body. Because lead exposure often occurs with no obvious symptoms, it frequently goes unrecognized. The current reference level at which the Centers for Disease Control and Prevention recommends public health actions be initiated is 3.5 mcg/dL in patients 0 to 5 years old and 5 mcg/dL for patients 6 years and older. The most recent National Health and Nutrition Examination Survey (NHANES) data shows that 97.5 percentile for blood lead levels in US adults age 16 years and older is 3.46 mcg/dL. In concurrence with the reference value concept that there is no safe level of lead in blood, the Council of State and Territorial Epidemiologists Occupational Health Subcommittee approved lowering the blood lead threshold from 5 to 3.5 mcg/dL for adults. Chelation therapy is generally indicated in children when whole blood lead concentrations are above 25 mcg/dL.

The Occupational Safety and Health Administration (OSHA) has published the following standards for employees

working in industry. OSHA Standards for General Industry (CFR 1910.1025) and Construction (CFR 1926.62) apply to workers exposed to airborne lead levels 30 mcg/m(3) or greater time-weighted average and require the removal of workers if a periodic and follow-up blood lead level is 60 mcg/dL (2.9 mcmol/L) or greater, 50 mcg/dL (2.4 mcmol/L) or greater for construction, or the average blood lead level of all tests over a 6-month period (or if there are fewer than 3 tests over a 6-month period, the average of 3 consecutive tests) is 50 mcg/dL (2.4 mcmol/L) or greater. Workers with a single blood lead level meeting the numerical criteria for medical removal must have their blood lead level retested within 2 weeks. If a worker is medically removed, a new blood lead level must be measured monthly during the removal period. Workers are permitted to return to work when their blood lead level is 40 mcg/dL (1.9 mcmol/L) or less. According to OSHA Lead Standards, a zinc protoporphyrin is also required on each occasion a blood lead level measurement is made.

Cautions

No significant cautionary statements

Clinical Reference

1. Centers for Disease Control and Prevention (CDC). National Report on Human Exposure to Environmental Chemicals. CDC; Updated September 29, 2023. Accessed October 24, 2023. Available at www.cdc.gov/exposurereport
2. Agency for Toxic Substances and Disease Registry: Toxicological Profile for Lead. US Department of Health and Human Services; August 2020. Accessed October 24, 2023. Available at www.atsdr.cdc.gov/ToxProfiles/tp13.pdf
3. de Burbure C, Buchet JP, Leroyer A, et al. Renal and neurologic effects of cadmium, lead, mercury, and arsenic in children: evidence of early effects and multiple interactions at environmental exposure levels. Environ Health Perspect. 2006;114(4):584-590
4. Kosnett MJ, Wedeen RP, Rothenberg SJ, et al. Recommendations for medical management of adult lead exposure. Environ Health Perspect. 2007;115(3):463-471
5. Jusko T, Henderson C, Lanphear B, et al. Blood lead concentrations <10 mcg/dL and child intelligence at 6 years of age. Environ Health Perspect. 2008;116(2):243-248
6. Strathmann FG, Blum LM. Toxic elements. In: Rifai N, Horwath AR, Wittwer CT, eds. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. 6th ed. Elsevier; 2018:907-910
7. Cantor AG, Hendrickson R, Blazina I, Griffin J, Grusing S, McDonagh MS. Screening for elevated blood lead levels in childhood and pregnancy: Updated evidence report and systematic review for the US Preventive Services Task Force. JAMA. 2019;321(15):1510-1526. doi: 10.1001/jama.2019.1004
8. CSTE Occupational Subcommittee. Management Guidelines for Blood Lead Levels in Adults. 2021.Accessed October 24, 2023. Available at: https://cdn.ymaws.com/www.cste.org/resource/resmgr/occupationalhealth/publications/ManagementGuidelinesforAdult.pdf

Performance

Method Description

The metal of interest is analyzed by inductively coupled plasma mass spectrometry.(Unpublished Mayo method)

PDF Report

No

Day(s) Performed
Monday through Saturday

Report Available
1 to 2 days

Specimen Retention Time
14 days

Performing Laboratory Location
Rochester

Fees & Codes

Fees
- Authorized users can sign in to Test Prices for detailed fee information.
- Clients without access to Test Prices can contact Customer Service 24 hours a day, seven days a week.
- Prospective clients should contact their account representative. For assistance, contact Customer Service.

Test Classification
This test was developed and its performance characteristics determined by Mayo Clinic in a manner consistent with CLIA requirements. It has not been cleared or approved by the US Food and Drug Administration.

CPT Code Information
83655

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
PBDV	Lead, Venous, w/Demographics, B	77307-7

Result ID	Test Result Name	Result LOINC® Value
65640	Lead, Venous, B	77307-7
PTAD8	Patient Street Address	56799-0
PTCI8	Patient City	68997-6
PTST8	Patient State	46499-0
PTZI8	Patient Zip Code	45401-7
PTCN8	Patient County	87721-7
PTPH8	Patient Home Phone	42077-8
PTRA8	Patient Race	32624-9
PTET8	Patient Ethnicity	69490-1
PTOC8	Patient Occupation	11341-5
PTEM8	Patient Employer	80427-8
GDFN8	Guardian First Name	79183-0

GDLN8	Guardian Last Name	79184-8
MDOR8	Health Care Provider Name	52526-1
MDAD8	Health Care Provider Street Address	74221-3
MDCI8	Health Care Provider City	52531-1
MDST8	Health Care Provider State	52532-9
MDZI8	Health Care Provider Zip Code	87720-9
MDPH8	Health Care Provider Phone	68340-9
LABP8	Submitting Laboratory Phone	65651-2