

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](#)
- [Trace Metals Analysis Specimen Collection and Transport](#)

Method Name

Inductively Coupled Plasma-Mass Spectrometry (ICP-MS)

NY State Available

Yes

Specimen

Specimen Type

Whole blood

Specimen Required

Patient Preparation: High concentrations of gadolinium and iodine are known to interfere with most metals 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 (Lead only) EDTA Tube, 3mL (T615)

-If ordering the trace element blood collection tube from Becton Dickenson (BD), order catalog #368381

Container/Tube:

Preferred: Royal blue-top BD Vacutainer Plus with EDTA blood collection tube

Acceptable: Tan-top (lead only) BD Vacutainer Plus with EDTA blood collection tube

Specimen Volume: 2 mL

Collection Instructions:

1. See [Trace Metals Analysis Specimen Collection and Transport](#) in Special Instructions for complete instructions.
2. Send specimen in original tube.

Forms

1. [Lead and Heavy Metals Reporting](#) (T491) in Special Instructions
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 and Interpretive
Clinical Information

Lead is a heavy metal that is 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 U.S. 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 also 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 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 delta-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 45 mcg/dL. The standard chelating agents currently in use are dimercaprol (British Anti-Lewisite, or BAL), CaNa₂-EDTA (or EDTA), penicillamine, and 2,3-dimercaptosuccinic acid (DMSA; Succimer).

Reference Values

All ages: <5.0 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 CDC recommends public health actions be initiated is 5 mcg/dL. Chelation therapy is generally indicated in children when whole blood lead concentrations are above 45 mcg/dL.

OSHA has published the following standards for employees working in industry. The OSHA Standards for General Industry (CFR 1910.1025) and Construction (CFR 1926.62) apply to workers exposed to airborne lead levels 30 mcg/m³ 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 the OSHA Lead Standards, a zinc protoporphyrin (ZPP) is also required on each occasion a blood lead level

measurement is made.

Cautions

No significant cautionary statements

Clinical Reference

1. CDC: National Report on Human Exposure to Environmental Chemicals. Updated Tables. Accessed: 01/2019. Available at: [cdc.gov/exposurereport](https://www.cdc.gov/exposurereport)
2. Agency for Toxic Substances and Disease Registry: Toxicological Profile for Lead. Accessed: 05/2019. 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;114:584-590
4. Kosnett MJ, Wedeen RP, Rothenberg SJ, et al: Recommendations for medical management of adult lead exposure. *Environ Health Perspect* 2007;115:463-471
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;116:243-248
6. Nader R, Horwath AR, Wittwer CT: Toxic Elements. In *Tietz Textbook of Clinical Chemistry and Molecular Diagnostics*. Chapter 42. Sixth Edition. Elsevier. 2018 pp 907-910

Performance**Method Description**

Lead (Pb) in whole blood is analyzed by inductively coupled plasma-mass spectrometry (ICP-MS) in standard mode using iridium (Ir) as an internal standard and using a salt matrix calibration.(Unpublished Mayo method)

PDF Report

No

Day(s) Performed

Monday through Saturday

Report Available

1 to 3 days

Specimen Retention Time

14 days

Performing Laboratory Location

Rochester

Fees and 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 Regional Manager. 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. This test has not been cleared or approved by the U.S. 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