MAYO CLINIC LABORATORIES

# Test Definition: PLP

Pyridoxal 5-Phosphate, Plasma

## Overview

### Useful For

Determining vitamin B6 status, including in persons who present with progressive nerve compression disorders, such as carpal tunnel and tarsal tunnel syndromes

Determining the overall success of a vitamin B6 supplementation program

Diagnosis and evaluation of hypophosphatasia

### Method Name

Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS)

### NY State Available

Yes

## Specimen

### Specimen Type

Plasma Heparin

### Shipping Instructions

Ship specimen in amber vial to protect from light.

### Specimen Required

**Patient Preparation:**

**1. Fasting: 12 hours, required**; Infants should have specimen collected before next feeding, water may be taken as needed

2. For 24 hours before specimen collection, patient **should not take multivitamins or vitamin supplements**.

**Supplies:** Amber Frosted Tube, 5 mL (T915)

**Collection Container/Tube:**

**Preferred:** Green top (sodium or lithium heparin) or Plasma gel separator (PST)

**Acceptable:** None

**Submission Container/Tube:** Amber vial

**Specimen Volume:** 1 mL

**Collection Instructions:**

1. Within 2 hours of collection, centrifuge at 4 degrees C.

2. Aliquot all plasma into amber vial and freeze immediately.

### Forms

If not ordering electronically, complete, print, and send a General Request (T239) with the specimen.

### Specimen Minimum Volume

0.75 mL

### Reject Due To

| | |
|---|---|
| Gross hemolysis | OK |
| Gross lipemia | OK |
| Gross icterus | OK |

### Specimen Stability Information

| Specimen Type | Temperature | Time | Special Container |
|---|---|---|---|
| Plasma Heparin | Frozen | 29 days | LIGHT PROTECTED |

## Clinical & Interpretive

### Clinical Information

Vitamin B6 is a generic term that refers to the pyridine-based compounds pyridoxine, 4-pyridoxic acid (PA), pyridoxamine, pyridoxal, and their phosphorylated derivatives. Pyridoxal-5'-phosphate (PLP) is the biologically active form and serves as a cofactor for more than 140 different enzyme reactions, representing 4% of all known catalytic activity. Deficiencies can occur in people with mutations of pyridoxal kinase (PLK) or pyridoxine 5' phosphate oxidase (PNPOx), as well as in individuals who are pregnant, have kidney disease, are severely malnourished, or have malabsorption. Additionally, deficiencies have been observed with the usage of certain drugs such as isoniazid, penicillamine, benserazide, and carbidopa. Vitamin B6 deficiency is a potential cause of burning mouth syndrome and a possible potentiating factor for carpal tunnel and tarsal tunnel syndromes. Persons who present chronic, progressive nerve compression disorders may be deficient in vitamin B6 and should be evaluated. Vitamin B6 deficiency is associated with symptoms of scaling of the skin, severe gingivitis, irritability, weakness, depression, dizziness, peripheral neuropathy, and seizures. In the pediatric population, deficiencies have been characterized by diarrhea, anemia, and seizures. Conversely, exceptionally high levels of vitamin B6 can also have toxic effects resulting in sensory and motor neuropathies. Markedly elevated PLP in conjunction with low or normal levels of pyridoxic acid are observed in cases of hypophosphatasia, a disorder caused by loss-of-function mutations of the gene ALPL that encodes the tissue-nonspecific isoenzyme of alkaline phosphatase.

### Reference Values

5-50 mcg/L

### Interpretation

Levels for fasting individuals falling in the range of 3 to 30 mcg/L for pyridoxic acid (PA) and 5 to 50 mcg/L for pyridoxal 5-phosphate (PLP) are indicative of adequate nutrition.

The following are interpretative guidelines based upon PLP and PA results:
If PLP is >100 mcg/L and PA is < or =30 mcg/L:
-The increased pyridoxal 5-phosphate is suggestive of hypophosphatasia. Consider analysis of serum alkaline

phosphatase isoenzymes (ALKP / Alkaline Phosphatase, Total and Isoenzymes, Serum) and urinary phosphoethanolamine (AAPD / Amino Acids, Quantitative, Random, Urine).

If PLP is >100 mcg/L and PA is 31 to 100 mcg/L or PLP is 81 to 100 mcg/L and PA is < or=30 mcg/L:
-The increased pyridoxal 5-phosphate is likely related to dietary supplementation; however, a mild expression of hypophosphatasia cannot be excluded. Consider analysis of serum alkaline phosphatase isoenzymes (ALKP / Alkaline Phosphatase, Total and Isoenzymes, Serum) and urinary phosphoethanolamine (AAPD / Amino Acids, Quantitative, Random, Urine).

If PLP is 51 to 80 mcg/L or PLP is 81 to 100 mcg/L and PA is >30 mcg/L; or PLP is >100 mcg/L and PA is >100 mcg/L:
-The elevated PLP is likely due to dietary supplementation.

### Cautions

Reference ranges were established using healthy fasting volunteers who abstained from vitamin supplementation for 24 hours prior to collection. Vitamin supplementation and nonfasting may result in elevated plasma vitamin concentrations.

### Clinical Reference

1.Whyte MP, Zhang F, Wenkert D, Mack KE, et al. Hypophosphatasia: Vitamin B6 status of affected children and adults. Bone. 2022;154:116204. doi:10.1016/j.bone.2021.116204
2. Vitamin B6-Fact Sheet for Health Professionals. US Department of Health and Human Services, National Institutes of Health. Office of Dietary Supplements. Updated June 16, 2023. Accessed February 5, 2025.
Available at: https://ods.od.nih.gov/factsheets/VitaminB6-HealthProfessional/
3. Sodi R, Taylor A. Vitamins and trace elements In: Rifai N, Horvath AR, Wittwer CT, eds. Tietz Fundamentals of Clinical Chemistry and Molecular Diagnostics. 8th ed. Elsevier; 2020:466-487
4. Morris MS, Picciano MF, Jacques PF, Selhub J. Plasma pyridoxal 5'-phosphate in the US population: the National Health and Nutrition Examination Survey, 2003-2004. Am J Clin Nutr. 2008;87(5):1446-54. doi:10.1093/ajcn/87.5.1446
5. Institute of Medicine. Food and Nutrition Board. Dietary Reference Intakes: Thiamin, Riboflavin, Niacin, Vitamin B6, Folate, Vitamin B12, Pantothenic Acid, Biotin, and Cholineexternal link disclaimer. National Academy Press; 1998

## Performance

### Method Description

The stable isotope pyridoxal 5-phosphate-d2 and/or pyridoxic acid-d2 is added to plasma as an internal standard. Meta-phosphoric acid solution is then added to precipitate the proteins. Following sedimentation of the proteins, an aliquot of the clarified supernatant fluid is subjected to separation of pyridoxal 5-phosphate, pyridoxic acid, and internal standards from other plasma components by reverse-phase high-performance liquid chromatography with quantitation by tandem mass spectrometry.(Maus A, Girtman A, Kiesling J, Faber J, Grebe SKG. Overcoming the chromatographic challenges when performing LC-MS/MS measurements of pyridoxal-5'-phosphate. J Chromatogr B Analyt Technol Biomed Life Sci. 2023;1217:123605. doi:10.1016/j.jchromb.2023)

### PDF Report

No

### Day(s) Performed
Monday through Thursday, Saturday, Sunday

### Report Available
2 to 7 days

### Specimen Retention Time
2 weeks

### Performing Laboratory Location
Mayo Clinic Laboratories - Rochester Superior Drive

## 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
84207

### LOINC® Information

| Test ID | Test Order Name | Order LOINC® Value |
|---|---|---|
| PLP | Pyridoxal 5-Phosphate (PLP), P | 30552-4 |

| Result ID | Test Result Name | Result LOINC® Value |
|---|---|---|
| 4047 | Pyridoxal 5-Phosphate (PLP), P | 30552-4 |