

Vitamin B6 Profile (Pyridoxal 5-Phosphate and Pyridoxic Acid), 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

Differentiating between hypophosphatasia or dietary supplementation as the likely cause of elevated pyridoxal-5'-phosphate (PLP) levels

## **Profile Information**

| Test Id | Reporting Name         | Available Separately | Always Performed |
|---------|------------------------|----------------------|------------------|
| PLP     | Pyridoxal 5-Phosphate  | Yes                  | Yes              |
|         | (PLP), P               |                      |                  |
| В6РА    | Pyridoxic Acid (PA), P | No                   | Yes              |

#### **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 must not take multivitamins or vitamin supplements.

Supplies: Amber Frosted Tube, 5 mL (T915)



Vitamin B6 Profile (Pyridoxal 5-Phosphate and Pyridoxic Acid), Plasma

**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 and aliquot into an amber vial.

2. Freeze immediately.

## **Specimen Minimum Volume**

0.75 mL

#### Reject Due To

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

# **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, 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 or pyridoxine 5'-phosphate oxidase, 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 mutation(s) of the gene *ALPL* that encodes the tissue-nonspecific isoenzyme of alkaline phosphatase

#### **Reference Values**



Vitamin B6 Profile (Pyridoxal 5-Phosphate and Pyridoxic Acid), Plasma

PYRIDOXAL 5-PHOSPHATE 5-50 mcg/L

PYRIDOXIC ACID 3-30 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 on PLP and PA results:

If PLP is >100 mcg/L and PA is < or =30 mcg/L:

-The increased PLP 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 PLP 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 specimen collection. Vitamin supplementation and nonfasting may result in elevated plasma vitamin concentrations.

# **Clinical Reference**

- 1. Whyte MP, Zhang F, Wenkert D, 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):1446-1454. doi:10.1093/ajcn/87.5.1446

#### **Performance**

# **Method Description**



Vitamin B6 Profile (Pyridoxal 5-Phosphate and Pyridoxic Acid), Plasma

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.2023.123605)

## **PDF Report**

No

#### Day(s) Performed

Monday through Thursday, Saturday, Sunday

## Report Available

2 to 5 days

## **Specimen Retention Time**

2 weeks

## **Performing Laboratory Location**

Mayo Clinic Laboratories - Rochester Superior Drive

# Fees & Codes

# Fees

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

#### **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**

82542

84207

# **LOINC®** Information

| Test ID | Test Order Name                    | Order LOINC® Value |
|---------|------------------------------------|--------------------|
| B6PRO   | Vitamin B6 Profile (PLP and PA), P | 95266-3            |
|         |                                    |                    |

| Result ID | Test Result Name | Result LOINC® Value |
|-----------|------------------|---------------------|
|-----------|------------------|---------------------|



Vitamin B6 Profile (Pyridoxal 5-Phosphate and Pyridoxic Acid), Plasma

| 61065 | Pyridoxic Acid (PA), P         | 1688-1  |
|-------|--------------------------------|---------|
| 4047  | Pyridoxal 5-Phosphate (PLP), P | 30552-4 |