Test Definition: PETNU

Phosphoethanolamine, Quantitative, Random, Urine

Overview

Useful For

To aid in the diagnosis of hypophosphatasia, especially in the setting of low alkaline phosphatase, bone fractures, and early tooth loss

Monitoring of affected individuals on therapy

Method Name

Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS)
This test is covered by patents held by Quest Diagnostics

NY State Available

Yes

Specimen

Specimen Type

Urine

Necessary Information

1. Patient's age is required.
2. Include family history, clinical condition (asymptomatic or acute episode), diet, and drug therapy information.

Specimen Required

Supplies: Urine Tubes, 10 mL (T068)
Container/Tube: Clean plastic urine tube
Specimen Volume: 2 mL
Collection Instructions:
1. Collect a random urine specimen.
2. No preservative.

Specimen Minimum Volume

1 mL

Reject Due To

All specimens will be evaluated at Mayo Clinic Laboratories for test suitability.

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Urine	Frozen (preferred)	70 days	
	Refrigerated	14 days	

Clinical & Interpretive

Clinical Information

Hypophosphatasia (HPP) is a metabolic bone disorder caused by disease-causing variants in the *ALPL* gene. This gene encodes the tissue-nonspecific alkaline phosphatase (TNSALP) enzyme, which plays an essential role in mineralization of the skeleton and teeth. As a result, HPP is characterized by defective mineralization of bones and teeth in the presence of low activity of serum and bone alkaline phosphatase (ALP).

Inheritance of HPP can be autosomal dominant or recessive. Clinical variability is common in both dominant and recessive forms, with the most severe cases resulting from autosomal recessive inheritance. HPP is most severe when is presents perinatally or in infancy and may be lethal, while heterozygous individuals are more likely to manifest moderate, mild, or even asymptomatic disease. Regardless of the number of *ALPL* disease-causing variants, many affected individuals suffer from pain, disability, and reduced quality of life because of decreased bone mineralization.

The disease spectrum of HPP is a continuum; however, there are seven clinically recognized forms of HPP determined by age of onset and severity of symptoms. These include perinatal severe, perinatal benign, infantile, severe childhood, mild childhood, adult, and odontohypophosphatasia. The wide range of clinical features and age of onset make timely diagnosis of HPP challenging, especially with later onset or milder forms of the disease. Common clinical findings include rickets, premature loss of deciduous teeth, vitamin B6 responsive seizures, and bone pain.

Hypophosphatasia can be diagnosed by decreased activity of serum ALP and increased excretion of the TNSALP substrate phosphoethanolamine (PEA) in urine. Molecular analysis of *ALPL* is also recommended to confirm a diagnosis of HPP (CGPH / Custom Gene Panel, Hereditary, Next-Generation Sequencing, Varies; specify gene list ID: RENAL-D5DR9D). There is strong genotype-phenotype correlation with some variants. Monitoring urinary PEA is useful for assessing response to enzyme replacement therapy, which was approved by the US Food and Drug Administration in 2015 and is a first-line therapy for several forms of HPP.

Reference Values

< or =12 months: 15-341 nmol/mg creatinine
13-35 months: 33-342 nmol/mg creatinine
3-6 years: 19-164 nmol/mg creatinine
7-8 years: 12-118 nmol/mg creatinine
9-17 years: <88 nmol/mg creatinine
> or =18 years: <48 nmol/mg creatinine
An interpretative report will be provided.

Interpretation

Elevations of phosphoethanolamine may be indicative of hypophosphatasia.

Abnormal results should be confirmed using ALKP / Alkaline Phosphatase, Total and Isoenzymes, Serum and molecular genetic testing of *ALPL* (CGPH / Custom Gene Panel, Hereditary, Next-Generation Sequencing, Varies; specify Gene List ID: RENAL-D5DR9D).

Cautions

Phosphoethanolamine (PEA) can also be elevated in individuals with other bone diseases and asymptomatic carriers of *ALPL* variants, as well as in individuals with hypertension, liver disease, and celiac disease. Normal excretion of PEA does not rule out a diagnosis of hypophosphatasia, as affected individuals without elevations have been reported.

Clinical Reference

1. Shajani-Yi Z, Ayala-Lopez N, Black M, Dahir KM. Urine phosphoethanolamine is a specific biomarker for hypophosphatasia in adults. Bone. 2022;163:116504
2. Dahir KM, Nunes ME. Hypophosphatasia. In: Adam MP, Feldman J, Mirzaa GM, et al, eds. GeneReviews [Internet]. University of Washington, Seattle; 2007. Accessed May 22, 2026. Available at www.ncbi.nlm.nih.gov/sites/books/NBK1150/
3. Seefried L, Genest F, Petryk A, Veith M. Effects of asfotase alfa in adults with pediatric-onset hypophosphatasia over 24 months of treatment. Bone. 2023;175:116856. doi:10.1016/j.bone.2023.116856

Performance

Method Description

Quantitative analysis of phosphoethanolamine (PEA) is performed by liquid chromatography tandem mass spectrometry (LC-MS/MS) by labeling PEA present in urine with aTRAQ Reagent 121. Samples are combined with aTRAQ Reagent 113-labeled Standard Mix and partially dried to remove readily volatile solvents. Phosphoethanolamine is separated and detected by LC-MS/MS (Sciex 4500). The concentration of PEA is established by comparison of the ion intensity (121-labeled PEA) to that of the internal standard (113-labeled PEA).(Unpublished Mayo method)

PDF Report

No

Day(s) Performed

Tuesday

Report Available

3 to 9 days

Specimen Retention Time

2 weeks

Performing Laboratory Location

Mayo Clinic Laboratories - Rochester Main Campus

Test Definition: PETNU

Phosphoethanolamine, Quantitative, Random, Urine

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

82131

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
PETNU	Phosphoethanolamine, QN, Random, U	In Process

Result ID	Test Result Name	Result LOINC® Value
623432	Interpretation	59462-2
623430	Phosphoethanolamine	28604-7
623431	Reviewed By	18771-6