Test Definition: PQNRU

Porphyrins, Quantitative, Random, Urine

Overview

Useful For

Preferred test to begin assessment for congenital erythropoietic porphyria and porphyria cutanea tarda and during symptomatic periods for acute intermittent porphyria, hereditary coproporphyria, and variegate porphyria when specimen transport **will not exceed 72 hours**

This test is **not useful for** the diagnosis of conjugated or unconjugated hyperbilirubinemia syndromes such as Dubin Johnson syndrome or Rotor syndrome.

Genetics Test Information

This is the preferred test during symptomatic periods for acute intermittent porphyria, hereditary coproporphyria, and variegate porphyria. The random urine collection for this test allows for the diagnosis to be established and treatment to be initiated quickly. However, this test should only be ordered when the specimen will be received at Mayo Clinic Laboratories within 72 hours of collection. If it will be longer than 72 hours, both PQNU / Porphyrins, Quantitative, 24 Hour, Urine and ALAUR / Aminolevulinic Acid, Urine should be ordered and collection guidelines must be followed.

Testing includes porphobilinogen and aminolevulinic acid, which are useful in the evaluation of the acute porphyrias.

This is the preferred test to begin assessment for congenital erythropoietic porphyria and porphyria cutanea tarda.

Testing Algorithm

The following algorithms are available:
-Porphyria (Acute) Testing Algorithm
-Porphyria (Cutaneous) Testing Algorithm

Special Instructions

- The Heme Biosynthetic Pathway
- Porphyria (Acute) Testing Algorithm
- Porphyria (Cutaneous) Testing Algorithm

Method Name

High-Performance Liquid Chromatography (HPLC) with Fluorometric Detection/Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS)

NY State Available

Yes

Specimen

Specimen Type

Urine

Ordering Guidance

This random urine test should be ordered when the specimen will be received at Mayo Clinic Laboratories within 72 hours. If transportation may take longer than 72 hours, order both PQNU / Porphyrins, Quantitative, 24 Hour, Urine and ALAUR / Aminolevulinic Acid, Urine and follow collection guidelines.

Shipping Instructions

Ship specimen in amber bottle to protect from light.

Necessary Information

Include a list of medications the patient is currently taking.

Specimen Required

Patient Preparation: For at least 24 hours before specimen collection, patient **must not** consume any alcohol.
Supplies: Urine Container - Amber, 60 mL (T596)
Container/Tube: 60-mL Amber urine container
Specimen Volume: 20 to 50 mL
Collection Instructions:
1. Collect a random urine specimen.
2. No preservative3. Specimens should be protected from light and frozen immediately following collection.

Forms

If not ordering electronically, complete, print, and send a Biochemical Genetics Test Request (T798) with the specimen.

Specimen Minimum Volume

15 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	72 hours	LIGHT PROTECTED

Clinical & Interpretive

Clinical Information

The porphyrias are a group of inherited disorders resulting from enzyme defects in the heme biosynthetic pathway. Depending on the specific enzyme involved, various porphyrins and their precursors accumulate in different specimen types. The patterns of porphyrin accumulation in erythrocytes and plasma and excretion of the heme precursors in urine and feces allow for the detection and differentiation of the porphyrias. See the Heme Biosynthetic Pathway.

The porphyrias are typically classified as erythropoietic or hepatic based upon the primary site of the enzyme defect. In addition, hepatic porphyrias can be further classified as chronic or acute, based on their clinical presentation.

The primary acute hepatic porphyrias, acute intermittent porphyria (AIP), hereditary coproporphyria (HCP), and variegate porphyria (VP), are associated with neurovisceral symptoms that typically onset during puberty or later. Common symptoms include severe abdominal pain, peripheral neuropathy, and psychiatric symptoms. Crises may be precipitated by a broad range of medications (including barbiturates and sulfa drugs), alcohol, infection, starvation, heavy metals, and hormonal changes. Photosensitivity is not associated with AIP but may be present in HCP and VP.

Cutaneous photosensitivity is associated with the chronic hepatic porphyrias, porphyria cutanea tarda (PCT), and the erythropoietic porphyrias including erythropoietic protoporphyria (EPP), X-linked protoporphyria (XLP), and congenital erythropoietic porphyria (CEP). Although genetic in nature, environmental factors may exacerbate symptoms, significantly impacting the severity and course of disease.

Congenital erythropoietic porphyria is an erythropoietic porphyria caused by uroporphyrinogen III synthase deficiency. Symptoms typically present in early infancy with red-brown staining of diapers, severe cutaneous photosensitivity with fluid-filled bullae and vesicles. Other common symptoms may include thickening of the skin, hypo- and hyperpigmentation, hypertrichosis, cutaneous scarring, and deformities of the fingers, eyelids, lips, nose, and ears. A few milder adult-onset cases have been documented as well as cases that are secondary to myeloid malignancies.

Porphyria cutanea tarda is the most common form of porphyria and caused by hepatic inhibition of the enzyme uroporphyrinogen decarboxylase (UROD). It is most often sporadic (acquired), but in about 20% of cases, a heterozygous genetic variant in *UROD* increases susceptibility to the disorder. The most prominent clinical characteristics are cutaneous photosensitivity and scarring on sun-exposed surfaces. Patients experience chronic blistering lesions resulting from mild trauma to sun-exposed areas. These fluid-filled vesicles rupture easily, become crusted, and heal slowly. Secondary infections can cause areas of hypo- or hyperpigmentation or sclerodermatous changes, and alopecia may develop at sites of repeated skin damage. Liver disease is common in patients with PCT as evidenced by abnormal liver function tests, with 30% to 40% of patients developing cirrhosis. In addition, there is an increased risk of hepatocellular carcinoma.

Hepatoerythropoietic porphyria is a rare autosomal recessive form of porphyria caused by homozygous or compound heterozygous genetic variants in *UROD.* It typically presents in early childhood with both erythropoietic and cutaneous manifestations and is similar to what is seen in CEP.

Urinary porphyrin determination is helpful in the diagnosis of most porphyrias including CEP, PCT, AIP, HCP, and VP. In addition, measurement of porphobilinogen (PBG) in urine is important in establishing the diagnosis of the acute neurologic porphyrias (AIP, HCP and VP). Neither urine porphyrins nor PBG is helpful in evaluating patients suspected of having EPP or XLP.

Of note, porphyrinuria may result from exposure to certain drugs and toxins or other medical conditions (ie, hereditary tyrosinemia type I). Heavy metals, halogenated solvents, various drugs, insecticides, and herbicides can interfere with heme production and cause "intoxication porphyria." Chemically, the intoxication porphyrias are characterized by increased excretion of uroporphyrin and/or coproporphyrin in urine.

A stepwise approach is typically most effective when evaluating patients with suspected porphyria. See Porphyria (Acute) Testing Algorithm and Porphyria (Cutaneous) Testing Algorithm or call 800-533-1710 to discuss testing strategies.

Reference Values

Uroporphyrin, Octa: < or =3.1 mcmol/mol creatinine
Heptacarboxylporphyrins: < or =0.9 mcmol/mol creatinine
Hexacarboxylporphyrins: < or =0.3 mcmol/mol creatinine
Pentacarboxylporphyrins: < or =1.2 mcmol/mol creatinine
Coproporphyrin, Tetra: < or =25.0 mcmol/mol creatinine
Porphobilinogen: < or =0.2 mmol/mol creatinine
Aminolevulinic Acid: < or = 2.3 mmol/mol creatinine

Interpretation

Abnormal results are reported with a detailed interpretation, which may include an overview of the results and their significance, a correlation to available clinical information provided with the specimen, differential diagnosis, and recommendations for additional testing when indicated and available.

Cautions

Porphobilinogen (PBG) and porphyrins are susceptible to degradation at high temperature, at pH below 5.0, and upon exposure to light.

Neither erythropoietic protoporphyria nor X-linked protoporphyria are detected utilizing urine porphyrins and PBG measurements.

Ethanol (alcohol) and a variety of medications are known to interfere with heme synthesis leading to elevations in urine porphyrins, particularly coproporphyrin. Coproporphyrin elevation without concomitant PBG elevation should not be used as the basis for the diagnosis of porphyria but may warrant follow-up testing with fecal porphyrin analysis.

Clinical Reference

1. Tortorelli S, Kloke K, Raymond K. Disorders of porphyrin metabolism. In: Dietzen DJ, Bennett MJ, Wong EDD, eds. Biochemical and Molecular Basis of Pediatric Disease. 4th ed. AACC Press; 2010:307-324
2. Nuttall KL, Klee GG. Analytes of hemoglobin metabolism-porphyrins, iron, and bilirubin. In: Burtis CA, Ashwood ER, eds. Tietz Textbook of Clinical Chemistry. 5th ed. WB Saunders Company; 2001:584-607
3. Anderson KE, Sassa S, Bishop DF, Desnick RJ. Disorders of heme biosynthesis: X-linked sideroblastic anemia and the porphyrias. In: Valle DL, Antonarakis S, Ballabio A, Beaudet AL, Mitchell GA. eds. The Online Metabolic and Molecular Bases of Inherited Disease. McGraw-Hill; 2019. Accessed August 3, 2026. Available at https://ommbid.mhmedical.com/content.aspx?bookid=2709&sectionid=225540906
4. Weiss Y, Chen B, Yasuda M, Nazarenko I, Anderson KE, Desnick RJ. Porphyria cutanea tarda and hepatoerythropoietic porphyria: Identification of 19 novel uroporphyrinogen III decarboxylase mutations. Mol Genet Metab. 2019;128(3):363-366. doi:10.1016/j.ymgme.2018.11.013

Performance

Method Description

An aliquot of urine is acidified and mesoporphyrin is added as an injection marker. Porphyrins in the acidified urine are separated by high-performance liquid chromatography, and the eluted porphyrins are quantified by comparison of their fluorescence intensity to that of known porphyrin standards.(Ford RE, Ou CN, Ellefson RD. Liquid-chromatographic

analysis for urinary porphyrins. Clin Chem. 1981;27[3]:397-401; de Andrade VL, Mateus ML, Aschner M, Dos Santos AM. Assessment of occupational exposures to multiple metals with urinary porphyrin profiles. J Integr OMICS. 2018;8[1]:216. doi:10.5584/jiomics.v8i1.216)

Porphobilinogen (PBG) in urine is quantified by liquid chromatography tandem mass spectrometry after addition of stable isotope-labeled PBG internal standard and solid-phase extraction.(Ford RE, Magera MJ, Kloke KM, Chezick PA, Fauq A, McConnell JP. Quantitative measurement of porphobilinogen in urine by stable-isotope dilution liquid chromatography-tandem mass spectrometry. Clin Chem. 2001;47[9]:1627-1632; Louleb M, Galvan I, Latrous L, et al. Detection of porphyrins in hair using capillary liquid chromatography-mass spectrometry. Int J Mol Sci. 2022;23[11]:6230. doi:10.3390/ijms23116230)

Aminolevulinic acid (ALA) is determined by liquid chromatography tandem mass spectrometry (LC-MS/MS) stable isotope dilution analysis. The urine is mixed with an internal standard ([13]C5, [15]N ALA-IS) and filtered using a 0.2 mcM nylon filter vial. The ratios of the extracted peak areas of ALA to ALA-IS determined by LC-MS/MS are used to calculate the concentration of ALA present in the sample.(Lacey, JM, Magera MJ, Tortorelli S. Delta aminolevulinic acid quantitation in urine by LC-MS/MS. Poster presented at: 59th ASMS Conference on Mass Spectrometry and Allied Topics; June 5-9, 2011; Denver, Colorado)

PDF Report
No

Day(s) Performed
Monday through Friday

Report Available
2 to 4 days

Specimen Retention Time
1 week

Performing Laboratory Location
Mayo Clinic Laboratories - Rochester Main Campus

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

84110-Porphobilinogen, quantitative

84120-Porphyrins, quantitation and fractionation

82135- ALA Delta Random Urine

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
PQNRU	Porphyrins, QN, Random, U	93707-8

Result ID	Test Result Name	Result LOINC® Value
32332	Uroporphyrin, Octa	25166-0
32333	Heptacarboxylporphyrins	34314-5
32334	Hexacarboxylporphyrins	96795-0
32335	Pentacarboxylporphyrins	34352-5
32336	Coproporphyrin, Tetra	25167-8
32337	Porphobilinogen	2811-8
32338	Interpretation	49291-8
623039	Aminolevulinic Acid, U	39782-8
623040	Reviewed By	18771-6