Test Definition: AAUCD

Amino Acids, Urea Cycle Disorders Panel, Plasma

Overview

Useful For
Follow-up of patients with urea cycle disorders

Genetics Test Information
Urea cycle disorders are a group of inherited disorders of nitrogen detoxification that result from defects in any of the enzymes involved in the urea cycle.

Disruption of the urea cycle can result in the accumulation of ammonia, which is toxic to the nervous system.

Highlights
Plasma amino acid analysis can be used to aid in the diagnosis of a urea cycle disorder as well as for follow-up of a known patient.

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

NY State Available
Yes

Specimen

Specimen Type
Plasma

Ordering Guidance
Body fluids are not acceptable specimens for this test.

For testing on urine specimens, order AAPD / Amino Acids, Quantitative, Random, Urine.

For testing on spinal fluid specimens, order AACSF / Amino Acids, Quantitative, Spinal Fluid.

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
Patient Preparation:
Fasting: 4 hours, required; infants should have specimen collected before next feeding (2-3 hours without total parenteral nutrition if possible)

Supplies: Sarstedt Aliquot Tube, 5 mL (T914)
Collection Container/Tube: Green top (sodium heparin)
Submission Container/Tube: Plastic vial
Specimen Volume: 0.5 mL
Collection Instructions:
1. Collect specimen and place on wet ice. Note: Thrombin-activated tubes **should not be used** for collection.
2. Centrifuge immediately or within 4 hours of collection if the specimen is kept at refrigerated temperature.
3. Being careful to ensure that no buffy coat is transferred, aliquot plasma into a plastic vial and freeze.

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

Specimen Minimum Volume
0.3 mL

Reject Due To

Gross hemolysis	OK
Gross lipemia	OK
Gross icterus	OK

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Plasma	Frozen	14 days	

Clinical & Interpretive

Clinical Information
Urea cycle disorders (UCD) are a group of inherited disorders of nitrogen detoxification that result when any of the enzymes in the urea cycle (carbamoylphosphate synthetase I [CPS I], ornithine transcarbamylase [OTC], argininosuccinic acid synthetase, argininosuccinic acid lyase, arginase, or the cofactor producer, N-acetyl glutamate synthetase [NAGS]), have deficient or reduced activity. The role of the urea cycle is to metabolize and clear waste nitrogen, and defects in any of the steps of the pathway can result in an accumulation of ammonia, which can be toxic to the nervous system. The urea cycle is also responsible for endogenous production of the amino acids citrulline, ornithine, and arginine. Infants with a complete urea cycle enzyme deficiency typically appear normal at birth but, as ammonia levels rise, present during the neonatal period with lethargy, seizures, hyper- or hypoventilation, and, ultimately, coma or death. Individuals with partial enzyme deficiency may present later in life, typically following an acute illness or other stressors. Symptoms may be less severe and may present with episodes of psychosis, lethargy, cyclical vomiting, and behavioral abnormalities. Patients with impaired ornithine metabolism due to ornithine aminotransferase deficiency may present with childhood-onset myopia progressing to vision loss in the 4th to 6th decades of life. Patients may or may not have accompanying hyperammonemia but display marked elevations in plasma ornithine.

All UCD are inherited autosomal recessively, with the exception of OTC deficiency, which is X-linked. UCD may be suspected in cases with elevated ammonia, normal anion gap, and a normal glucose. Plasma amino acids can be used to aid in the diagnosis of UCD and may aid in monitoring treatment effectiveness. Measurement of urinary orotic acid, enzyme activity (CPS I, OTC, or NAGS), and molecular genetic testing can help to distinguish the conditions and allows for diagnostic confirmation.

Acute treatment for UCD consists of dialysis and administration of nitrogen scavenger drugs to reduce ammonia concentration. Chronic management typically involves restriction of dietary protein with essential amino acid supplementation. More recently, orthotopic liver transplantation has been used with success in treating some patients.

Reference Values

Glutamine
<24 months: 356-857 nmol/mL
2-17 years: 353-790 nmol/mL
> or =18 years: 447-774 nmol/mL

Ornithine
<24 months: 32-171 nmol/mL
2-17 years: 32-148 nmol/mL
> or =18 years: 39-154 nmol/mL

Citrulline
<24 months: 8-42 nmol/mL
2-17 years: 12-44 nmol/mL
> or =18 years: 18-57 nmol/mL

Arginine
<24 months: 28-164 nmol/mL
2-17 years: 28-156 nmol/mL
> or =18 years: 45-144 nmol/mL

Argininosuccinic Acid
<5 nmol/mL

Reference value applies to all ages.

Interpretation

The quantitative results of glutamine, ornithine, citrulline, arginine, and argininosuccinic acid with age-dependent reference values are reported without added interpretation. When applicable, reports of abnormal results may contain an interpretation based on available clinical interpretation.

Cautions

Reference values are for fasting patients.

Clinical Reference

1. Brusilow SW, Horwich AL. Urea cycle enzymes. 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 April 22, 2024. https://ommbid.mhmedical.com/content.aspx?bookid=2709&sectionid=225084071
2. Haberle J, Burlina A, Chakrapani A, et al. Suggested guidelines for diagnosis and management of urea cycle disorders: First revision. J Inherit Metab Dis. 2019;42(6):1192-1230. doi:10.1002/jimd.12100
3. Valle D, Simell O. The Hyperornithinemias. 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 April 22, 2024. https://ommbid.mhmedical.com/content.aspx?bookid=2709&sectionid=225083672
4. Ah Mew N, McCarter R, Izem R, et al. Comparing Treatment Options for Urea Cycle Disorders. Washington (DC): Patient-Centered Outcomes Research Institute (PCORI); December 2020

Performance

Method Description

Quantitative analysis of amino acids is performed by liquid chromatography tandem mass spectrometry. Patient samples are combined with isotopically labeled internal standard. Following protein precipitation, the supernatant is subjected to hydrophilic-interaction liquid chromatography for the separation of isomers with MS/MS detection of the underivatized amino acids.(Unpublished Mayo method)

PDF Report

No

Day(s) Performed

Monday through Friday

Report Available

3 to 5 days

Specimen Retention Time

2 weeks

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.

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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

82136

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
AAUCD	Amino Acid, Urea Cycle Panel, P	100368-0

Result ID	Test Result Name	Result LOINC® Value
32440	Glutamine	20643-3
32441	Citrulline	20640-9
32442	Argininosuccinic Acid	32227-1
32443	Arginine	20637-5
32444	Ornithine	20652-4
32445	Interpretation (AAUCD)	49247-0