Test Definition: C4U

C4 Acylcarnitine, Quantitative, Random, Urine

Overview

Useful For

Evaluation of patients with abnormal newborn screens showing elevations of iso-/butyrylcarnitine to aid in the differential diagnosis of short-chain acyl-CoA dehydrogenase and isobutyryl-CoA dehydrogenase deficiencies

Genetics Test Information

Elevated iso-/butyrylcarnitine (C4) in plasma or newborn screening blood spots is due to either short chain acyl-CoA dehydrogenase (SCAD) deficiency or isobutyryl-CoA dehydrogenase (IBD) deficiency.

Urine C4 results can distinguish between SCAD deficiency, which results in normal C4 in urine, and IBD deficiency, which results in elevated C4 in urine.

Method Name

Flow Injection Analysis-Tandem Mass Spectrometry (FIA-MS/MS)

NY State Available

Yes

Specimen

Specimen Type

Urine

Ordering Guidance

This second-tier test is used specifically to evaluate a newborn screening elevation of iso-/butyrylcarnitine and **must not** be ordered with either C5OHU / C5-OH Acylcarnitine, Quantitative, Random, Urine or C5DCU / C5-DC Acylcarnitine, Quantitative, Random, Urine.

For general screening for metabolic disorders, see OAU / Organic Acids Screen, Random, Urine; ACRN / Acylcarnitines, Quantitative, Plasma; and AAQP / Amino Acids, Quantitative, Plasma.

Necessary Information

Patient's age, family history, clinical condition (asymptomatic or acute episode), diet, and drug therapy information is requested but not required.

Specimen Required

Patient Preparation: If clinically feasible, discontinue L-carnitine supplementation at least 72 hours before specimen collection**.**
Supplies: Urine Tubes, 10 mL (T068)
Collection Container/Tube: Clean, plastic urine collection container
Submission Container/Tube: Plastic, 10 mL urine tube

Specimen Volume: 5 mL

Collection Instructions:

1. Collect a random urine specimen.
2. Freeze specimen immediately.

Forms

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

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)	7 days	
	Refrigerated	24 hours	

Clinical & Interpretive

Clinical Information

An isolated elevation of iso-/butyrylcarnitine (C4) in plasma or newborn screening blood spots is related to a diagnosis of either short chain acyl-CoA dehydrogenase (SCAD) deficiency or isobutyryl-CoA dehydrogenase (IBD) deficiency. Diagnostic testing by acylcarnitine analysis, including the evaluation of C4 excretion in urine, is necessary to differentiate the 2 clinical entities.(1) Patients with IBD deficiency excrete an abnormal amount of C4 acylcarnitine in urine, whereas patients with SCAD deficiency can have a normal excretion of this metabolite.

Reference Values

<3.00 millimoles/mole creatinine

Interpretation

Almost all patients with isobutyryl-CoA dehydrogenase deficiency excrete an abnormal amount of iso-/butyrylcarnitine (C4) in their urine. Some, but not all, affected individuals also excrete elevated levels of isobutyrylglycine. Conversely, patients with short-chain acyl-CoA dehydrogenase deficiency can have a normal excretion of C4.

Cautions

The results of urine acylcarnitines are typically not informative when the patient is receiving L-carnitine supplements.

Clinical Reference

1. Miller MJ, Cusmano-Ozog K, Oglesbee D, Young S. ACMG Laboratory Quality Assurance Committee: Laboratory analysis of acylcarnitines, 2020 update: a technical standard of the American College of Medical Genetics and Genomics (ACMG). Genet Med. 2021;23(2):249-258
2. Oglesbee D, Vockley J, Ensenauer RE, et al. Ten cases of isobutyryl-CoA dehydrogenase (IBDH) deficiency detected by

newborn screening. J Inherit Metab Dis. 2005;28(Suppl 1):13. doi:10.1007/s10545-004-0001-x
3. Oglesbee D, He M, Majumder N, et al. Development of a newborn screening follow-up algorithm for the diagnosis of isobutyryl-CoA dehydrogenase deficiency. Genet Med. 2007;9(2):108-116

Performance

Method Description

Acylcarnitines, including iso-butyrylcarnitine, are determined in urine by flow injection analysis tandem mass spectrometry using acetyl-d3-carnitine, propionyl-d3-carnitine, butyryl-d3-carnitine, octanoyl-d3-carnitine, dodecanoyl-d3-carnitine, and palmitoyl-d3-carnitine as internal standards. The supernatant is evaporated and the residue treated with n-butanolic hydrochloric acid yielding the acylcarnitines for analysis as their n-butyl esters.(Tortorelli S, Hahn SH, Cowan TM, et al. The urinary excretion of glutarylcarnitine is an informative tool in the biochemical diagnosis of glutaric acidemia type I. Mol Genet Metab. 2005;84[2]:137-143; Miller MJ, Cusmano-Ozog K, Oglesbee D, Young S. ACMG Laboratory Quality Assurance Committee. Laboratory analysis of acylcarnitines, 2020 update: a technical standard of the American College of Medical Genetics and Genomics [ACMG]. Genet Med. 2021;23[2]:249-258)

PDF Report

No

Day(s) Performed

Monday, Wednesday, Friday

Report Available

2 to 5 days

Specimen Retention Time

1 month

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.

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CPT Code Information

82017

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
C4U	C4 Acylcarnitine, QN, U	53111-1

Result ID	Test Result Name	Result LOINC® Value
88829	C4 Acylcarnitine, QN, U	53111-1
28075	C4 Interpretation	59462-2
34468	Reviewed By	18771-6