Test Definition: G6SW

N-Acetylgalactosamine 6 Slft, WBC

Overview

Useful For

Preferred test to rule-out mucopolysaccharidosis IVA (Morquio A syndrome)

The test is **not useful** to establish carrier status for Morquio A syndrome.

Genetics Test Information

This is the preferred test to rule-out mucopolysaccharidosis IVA, (MPS IVA; Morquio A syndrome).

Morquio A is an autosomal recessive mucopolysaccharidosis caused by reduced or absent N-acetylgalactosamine-6-sulfate sulfatase (GALNS) enzyme activity.

Although clinically similar, Morquio A is distinct from Morquio B at the molecular and enzyme levels. Enzyme analysis is necessary to distinguish between the two.

Testing Algorithm

See Lysosomal Storage Disorders Diagnostic Algorithm, Part 1 in Special Instructions.

Special Instructions

- Informed Consent for Genetic Testing
- Biochemical Genetics Patient Information
- Informed Consent for Genetic Testing (Spanish)
- Lysosomal Storage Disorders Diagnostic Algorithm, Part 1

Method Name

Fluorometric

NY State Available

Yes

Specimen

Specimen Type

Whole Blood ACD

Ordering Guidance

This test **cannot** be used to establish carrier status for Morquio A syndrome.

Shipping Instructions

For optimal isolation of leukocytes, it is recommended the specimen arrive within 7 days of collection to be stabilized. Collect specimen Monday through Thursday only and not the day before a holiday. Specimen should be collected and packaged as close to shipping time as possible.

Specimen Required

Container/Tube:

Preferred: Yellow top (ACD solution B)

Acceptable: Yellow top (ACD solution A)

Specimen Volume: 6 mL

Collection Instructions: Send specimen in original tube. Do not transfer blood to other containers.

Forms

1. **New York Clients-Informed consent is required.** Document on the request form or electronic order that a copy is on file. The following documents are available in Special Instructions:

-Informed Consent for Genetic Testing (T576)

-Informed Consent for Genetic Testing-Spanish (T826)

2. Biochemical Genetics Patient Information (T602) in Special Instructions.

3. If not ordering electronically, complete, print, and send an Inborn Errors of Metabolism Test Request (T798) with the specimen.

Specimen Minimum Volume

5 mL

Reject Due To

Gross hemolysis	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Whole Blood ACD	Refrigerated (preferred)	7 days	YELLOW TOP/ACD
	Ambient	7 days	YELLOW TOP/ACD

Clinical and Interpretive

Clinical Information

Mucopolysaccharidosis IVA, (MPS IVA; Morquio A syndrome) is an autosomal recessive mucopolysaccharidosis caused by reduced or absent *N*-acetylgalactosamine-6-sulfate sulfatase (GALNS) enzyme activity. The mucopolysaccharidoses are a group of disorders caused by the deficiency of any of the enzymes involved in the stepwise degradation of dermatan sulfate, heparan sulfate, keratan sulfate, or chondroitin sulfate (referred to as mucopolysaccharides: MPS or glycosaminoglycans: GAG). Accumulation of MPS in lysosomes interferes with normal functioning of cells, tissues, and organs.

Clinical features and severity of symptoms of MPS IVA are widely variable and affect multiple body systems. Clinical features may include skeletal dysplasia, short stature, dental anomalies, corneal clouding, respiratory insufficiency, and cardiac disease. Intelligence is usually normal. Treatment options are mostly limited to symptom management; however, more recently available enzyme replacement therapy has shown to be effective in improving some function and quality of life for individuals with MPS IVA. Estimates of the incidence of MPS IVA syndrome range from 1 in 200,000 to 1 in 300,000 live births.

A diagnostic workup in an individual with MPS IVA typically demonstrates elevated levels of urinary MPS and increased keratan sulfate and chondroitin-6-sulfate detected via quantitative and qualitative liquid chromatography-tandem mass spectrometry (LC-MS/MS) analysis of the specific sulfates. Morquio B is a distinct disorder caused by a deficiency of beta-galactosidase and has a significant number of overlapping clinical features with MPS IVA. Enzyme analysis is necessary to distinguish between the 2 types. Reduced or absent activity of *N* -acetylgalactosamine-6-sulfate sulfatase enzyme in leukocytes and/or fibroblasts can confirm a diagnosis of MPS IVA. Sequencing of the *GALNS* gene allows for detection of disease-causing variants in affected patients and identification of familial variants allows for testing of at-risk family members.

Reference Values

> or =92 nmol/17 hour/mg protein

Interpretation

Very low enzyme activity levels are consistent with mucopolysaccharidosis IVA (Morquio A syndrome).

Cautions

No significant cautionary statements

Clinical Reference

1. Hendriksz CJ, Harmatz P, Beck M, et al: Review of clinical presentation and diagnosis of mucopolysaccharidosis IVA. Mol Genet Metab. 2013 Sep-Oct;110(1-2):54-64. doi: 10.1016/j.ymgme.2013.04.002

2. Enns GM, Steiner RD, Cowan TM: Lysosomal disorders. In: Sarafoglou K, Hoffman GF, Roth KS, eds. Pediatric Endocrinology and Inborn Errors of Metabolism. McGraw-Hill Medical Division; 2009:732

3. Haddley K: Elosulfase alfa. Drugs Today (Barc). 2014 Jul;50(7):475-483. doi: 10.1358/dot.2014.50.7.2177904

Performance

Method Description

Mucopolysaccharidosis IVA (MPS IVA; Morquio A syndrome) results from a deficiency of the *N* -acetylgalactosamine-6-sulfate sulfatase enzyme. This enzyme hydrolyzes a sulfate group from the 6 position of galactose at the nonreducing terminus of the mucopolysaccharides, keratin sulfate and chondroitin-6 sulfate. In this procedure, 4- methylumbelliferyl (MU)-beta-D-galactoside-6-sulfate is used as the substrate. The enzyme will cleave the 6-sulfate from the galactose residue and a second incubation with excess beta-galactosidase will cleave the 4MU, which is measured fluorometrically and calculated against a calibration of 4MU.(Package insert: Laboratory protocol for enzyme analysis for Morquio A disease [MPS IV A]. Moscerdam Substrates;Â van Diggelen OP, Zhao H, Kleijer WJ, et al: A fluorimetric enzyme assay for the diagnosis of Morquio disease type A. Clin Chim Acta. 1990;187:131-140; Cowan T, Pasquali M: Laboratory Investigations of Inborn Errors of Metabolism. In: Sarafoglou K, Hoffman GF, Roth KS, eds. Pediatric Endocrinology and Inborn Errors of Metabolism. 2nd ed. 2017:1139-1158)

PDF Report

No

Day(s) Performed

Varies

Report Available

30 to 45 days

Specimen Retention Time

WBC homogenate: 1 month

Performing Laboratory Location

Rochester

Fees and 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 Regional Manager. 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. This test has not been cleared or approved by the U.S. Food and Drug Administration.

CPT Code Information

82657

LOINC® Information

Test ID	Test Order Name	Order LOINC Value
G6SW	N-Acetylgalactosamine 6 Slft, WBC	24096-0

Result ID	Test Result Name	Result LOINC Value
62409	N-Acetylgalactosamine 6 Slft, WBC	24096-0
35778	Interpretation (G6SW)	59462-2
35777	Reviewed By	18771-6