Overview

Useful For
Diagnosis of mucopolysaccharidosis I, Hurler, Scheie, and Hurler-Scheie syndromes in leukocytes

This test is not useful for determining carrier status.

Genetics Test Information
This test provides diagnostic testing for patients with clinical signs and symptoms suspicious for mucopolysaccharidosis type I (MPS I).

Enzyme testing is included in the diagnostic workup for infants following a positive newborn screen result for MPS I.

Testing Algorithm
The following are available in Special Instructions:

- Lysosomal Storage Disorders Diagnostic Algorithm, Part 1
- Newborn Screen Follow-up for Mucopolysaccharidosis Type I
- Newborn Screening Act Sheet Mucopolysaccharidoses Type I: Decreased Alpha-L-Iduronidase

Special Instructions

- Informed Consent for Genetic Testing
- Biochemical Genetics Patient Information
- Newborn Screening Act Sheet Mucopolysaccharidoses Type I: Decreased Alpha-L-Iduronidase
- Newborn Screen Follow-up for Mucopolysaccharidosis Type I
- Informed Consent for Genetic Testing (Spanish)
- Lysosomal Storage Disorders Diagnostic Algorithm, Part 1

Method Name
Flow Injection Analysis-Tandem Mass Spectrometry

NY State Available
Yes

Specimen

Specimen Type
Whole Blood ACD

Advisory Information
This test is preferred for diagnostic testing. For carrier detection, order MPS1Z / Hurler Syndrome, Full Gene Analysis, Varies.

Shipping Instructions
For optimal isolation of leukocytes, it is recommended the specimen arrive refrigerated within 96 hours 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) or lavender top (EDTA)

**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

**Specimen Minimum Volume**

2 mL

**Reject Due To**

| Gross hemolysis | Reject |

**Specimen Stability Information**

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<th>Specimen Type</th>
<th>Temperature</th>
<th>Time</th>
<th>Special Container</th>
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<td>Refrigerated (preferred)</td>
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<td></td>
<td>Ambient</td>
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**Clinical and Interpretive**

**Clinical Information**

The mucopolysaccharidoses (MPS) are a group of lysosomal storage 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, also known as glycosaminoglycans (GAG). Accumulation of GAG in lysosomes interferes with normal functioning of cells, tissues, and organs. There are 11 known disorders that involve the accumulation of GAG. MPS disorders involve multiple organ systems and are characterized by coarse facial features, cardiac abnormalities, organomegaly, intellectual disabilities, short stature, and skeletal abnormalities.

Mucopolysaccharidosis I (MPS I) is an autosomal recessive disorder caused by reduced or absent activity of the enzyme alpha-L-iduronidase due to variants in the *IDUA* gene. Deficiency of alpha-L-iduronidase can result in a wide range of phenotypes categorized into 3 syndromes: Hurler syndrome (MPS IH), Scheie syndrome (MPS IS), and
Hurler-Scheie syndrome (MPS IH/S). Because these syndromes cannot be distinguished biochemically, they are also referred to as MPS I and attenuated MPS I.

Clinical features and severity of symptoms of MPS I are variable, ranging from severe disease to an attenuated form that generally presents at a later onset with a milder clinical presentation. In general, symptoms may include coarse facies, progressive dysostosis multiplex, hepatosplenomegaly, corneal clouding, hearing loss, intellectual disabilities or learning difficulties, and cardiac valvular disease. The incidence of MPS I is approximately 1 in 100,000 live births. Treatment options include hematopoietic stem cell transplantation and enzyme replacement therapy.

Individuals with MPS I typically demonstrate elevated urinary levels of the GAG dermatan sulfate and heparan sulfate (see MPSSC / Mucopolysaccharides Screen, Random, Urine; MPSWB / Mucopolysaccharides, Blood). Reduced or absent activity of alpha L-iduronidase can confirm a diagnosis of MPS I; however, enzymatic testing is not reliable for carrier detection. Molecular sequence analysis of the *IDUA* gene allows for detection of a disease-causing variant in affected individuals and subsequent carrier detection in relatives (see MPS1Z / Hurler Syndrome, Full Gene Analysis, Varies). To date, a clear genotype-phenotype correlation has not been established.

**Reference Values**

> or =2.06 nmol/hour/mg protein

An interpretive report will be provided.

**Interpretation**

Results below 2.06 nmol/hour/mg protein in properly submitted specimens are consistent with alpha-L-iduronidase deficiency (mucopolysaccharidosis I). Further differentiation between Hurler, Scheie, and Hurler-Scheie is dependent upon the clinical findings.

Normal results (> or =2.06 nmol/hour/mg protein) are not consistent with alpha-L-iduronidase deficiency.

**Cautions**

The presence of a pseudodeficiency allele may cause reduced activity of alpha-L-iduronidase in the artificial substrate used in this assay. This can result in values below the normal reference range, but will typically be greater than levels found in individuals with mucopolysaccharidosis I (MPS I).

This test does not differentiate between Hurler and Scheie syndromes.

Enzyme levels may be normal in individuals receiving enzyme replacement therapy or who have undergone hematopoietic stem cell transplant.

**Clinical Reference**


**Performance**

**Method Description**

The specimens are incubated with a mix of substrate and internal standard for acid sphingomyelinase (ASM), beta-glucocerebrosidase (ABG), acid alpha-glucosidase (GAA), alpha-galactosidase (GLA), galactocerebrosidase (GALC), and alpha-L-iduronidase (IDUA). The sample is then purified by liquid-liquid extraction. The extract is evaporated and reconstituted before analysis by tandem mass spectrometry. (Unpublished Mayo method)

**PDF Report**

No

**Day(s) and Time(s) Test Performed**

Specimens are processed Monday through Sunday.

Assay is performed: Varies

**Analytic Time**

5 days

**Maximum Laboratory Time**

10 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 Definition: IDUAW

**Alpha-L-Iduronidase, Leukocytes**

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