

## Overview

### Useful For

Identifying variants within the *GNS* gene

Confirmation of a diagnosis of mucopolysaccharidosis type IIID

Carrier testing when there is a family history of mucopolysaccharidosis type IIID, but disease-causing variants have not been previously identified

### Reflex Tests

Test ID	Reporting Name	Available Separately	Always Performed
CULFB	Fibroblast Culture for Genetic Test	Yes	No

### Testing Algorithm

If skin biopsy is received, fibroblast culture for genetic test will be performed at an additional charge.

### Special Instructions

- [Molecular Genetics: Biochemical Disorders Patient Information](#)
- [Informed Consent for Genetic Testing](#)
- [Blood Spot Collection Card-Spanish Instructions](#)
- [Blood Spot Collection Card-Chinese Instructions](#)
- [Informed Consent for Genetic Testing \(Spanish\)](#)
- [Blood Spot Collection Instructions](#)

### Method Name

Polymerase Chain Reaction (PCR) followed by DNA Sequencing

### NY State Available

Yes

## Specimen

### Specimen Type

Varies

### Advisory Information

For diagnostic testing or monitoring ongoing therapy, order either MPSBS / Mucopolysaccharidosis, Blood Spot or MPSQU / Mucopolysaccharides Quantitative, Random, Urine.

### Shipping Instructions

Specimen preferred to arrive within 96 hours of collection.

### Specimen Required

**Patient Preparation:** A previous bone marrow transplant from an allogenic donor will interfere with testing. Call

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800-533-1710 for instructions for testing patients who have received a bone marrow transplant.

**Submit only 1 of the following specimens:**

**Preferred:**

**Specimen Type:** Whole blood

**Container/Tube:**

**Preferred:** Lavender top (EDTA) or yellow top (ACD)

**Acceptable:** Any anticoagulant

**Specimen Volume:** 3 mL

**Collection Instructions:**

1. Invert several times to mix blood.
2. Send specimen in original tube.

**Specimen Stability Information:** Ambient (preferred)/Refrigerated

**Specimen Type:** Cultured fibroblasts

**Container/Tube:** T-75 or T-25 flask

**Specimen Volume:** 1 Full T-75 flask or 2 full T-25 flasks

**Specimen Stability Information:** Ambient (preferred)/Refrigerated <24 hours

**Specimen Type:** Skin biopsy

**Supplies:** Fibroblast Biopsy Transport Media (T115)

**Container/Tube:** Sterile container with any standard cell culture media (eg, minimal essential media, RPMI 1640). The solution should be supplemented with 1% penicillin and streptomycin.

**Specimen Volume:** 4-mm punch

**Specimen Stability Information:** Refrigerated (preferred)/Ambient

**Acceptable:**

**Specimen Type:** Blood spot

**Supplies:** Card - Blood Spot Collection (Filter Paper) (T493)

**Container/Tube:**

**Preferred:** Collection card (Whatman Protein Saver 903 Paper)

**Acceptable:** Ahlstrom 226 filter paper or Blood Spot Collection Card

**Specimen Volume:** 2 to 5 Blood spots

**Collection Instructions:**

1. An alternative blood collection option for a patient older than 1 year of age is finger stick.
2. Let blood dry on the filter paper at ambient temperature in a horizontal position for 3 hours.
3. Do not expose specimen to heat or direct sunlight.
4. Do not stack wet specimens.
5. Keep specimen dry.

**Specimen Stability Information:** Ambient (preferred)/Refrigerated

**Additional Information:**

1. For collection instructions, see [Blood Spot Collection Instructions](#) in Special Instructions.
2. For collection instructions in Spanish, see [Blood Spot Collection Card-Spanish Instructions](#) (T777) in Special Instructions.
3. For collection instructions in Chinese, see [Blood Spot Collection Card-Chinese Instructions](#) (T800) in Special Instructions.

**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. [Molecular Genetics: Biochemical Disorders Patient Information](#)(T527) 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**

Blood: 1 mL

Blood Spots: 3

**Reject Due To**

All specimens will be evaluated at Mayo Clinic Laboratories for test suitability.

**Specimen Stability Information**

Specimen Type	Temperature	Time	Special Container
Varies	Varies		

## Clinical and Interpretive

### Clinical Information

[Mucopolysaccharidosis type III \(MPS-III\), also known as Sanfilippo syndrome, is an autosomal recessive condition that consists of 4 different types \(A, B, C, and D\). Each type of MPS-III results from the absence of 1 of 4 lysosomal enzymes, which leads to the lysosomal accumulation of heparan sulfate.](#)

Mucopolysaccharidosis type IIID (MPS-IIID), or Sanfilippo syndrome D, is caused by variants in the *GNS* gene and is characterized by reduced or absent activity of the N-acetylglucosamine-6-sulfatase enzyme. This test screens for variants in all 14 exons of the *GNS* gene.

Sanfilippo syndrome is characterized by severe central nervous system (CNS) degeneration with only mild physical disease. Onset of clinical features, most commonly behavioral problems and delayed development, usually occurs between 2 and 6 years in a child who previously appeared normal. Severe neurologic degeneration occurs in most patients by 6 to 10 years, accompanied by a rapid deterioration of social and adaptive skills. Death generally occurs by the 20<sup>th</sup>s.

Measurement of mucopolysaccharides in blood or urine can aid in diagnosis and ongoing therapeutic monitoring (MPSBS / Mucopolysaccharidosis, Blood Spot or MPSQU / Mucopolysaccharides Quantitative, Random, Urine).

### Reference Values

An interpretive report will be provided.

### Interpretation

All detected alterations will be evaluated according to American College of Medical Genetics and Genomics (ACMG) recommendations.<sup>(1)</sup> Variants will be classified based on known, predicted, or possible pathogenicity and reported with interpretive comments detailing their potential or known significance.

### Cautions

A small percentage of individuals who are carriers or have a diagnosis of MPS-IIID may have a variant that is not identified by this method (eg, large genomic deletions, promoter alterations). The absence of a variant, therefore, does not eliminate the possibility of positive carrier status or the diagnosis of MPS-IIID. The preferred approach to carrier testing is to first document the presence of a *GNS* gene variant in an affected family member.

In some cases, DNA alterations of undetermined significance may be identified.

Rare polymorphisms exist that could lead to false-negative or false-positive results. If results obtained do not match the clinical findings, additional testing should be considered.

Test results should be interpreted in the context of clinical findings, family history, and other laboratory data. Errors in our interpretation of results may occur if information given is inaccurate or incomplete.

### Clinical Reference

1. Richards S, Aziz N, Bale S, et al: Standards and guidelines for the interpretation of sequence variants: a joint consensus recommendation of the American College of Medical Genetics and Genomics and the Association for

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Molecular Pathology. Genet Med. 2015 May;17(5):405-424

2. Jansen AC, Cao H, Kaplan P, et al: Sanfilippo syndrome type D: natural history and identification of 3 novel mutations in the GNS Gene. Arch Neurol. 2007;64(11):1629-1634

3. Valstar MJ, Ruijter GJ, van Diggelen OP, et al: Sanfilippo syndrome: a mini-review. J Inher Metab Dis. 2008;31(2):240-252

## Performance

### Method Description

DNA sequencing is utilized to test for the presence of variants in all 14 exons of the *GNS* gene. (Unpublished Mayo method)

### PDF Report

No

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

Performed weekly; Varies

### Analytic Time

14 days

### Maximum Laboratory Time

20 days

### Specimen Retention Time

Whole Blood: 2 weeks (if available); Extracted DNA: 3 months

### 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

81479-Unlisted molecular pathology procedure code

88233-Tissue culture, skin or solid tissue biopsy (if appropriate)

88240-Cryopreservation (if appropriate)

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**LOINC® Information**

Test ID	Test Order Name	Order LOINC Value
MP3DZ	MPS IIID, Full Gene Analysis	95776-1

Result ID	Test Result Name	Result LOINC Value
52566	Result Summary	50397-9
52567	Result	82939-0
52568	Interpretation	69047-9
52569	Additional Information	48767-8
52570	Specimen	31208-2
52571	Source	31208-2
52572	Released By	18771-6