Test Definition: ANAS

Alpha-N-Acetylglucosaminidase, S

Overview

Useful For

Diagnosis of Sanfilippo syndrome type B (mucopolysaccharidoses type IIIB)

This test is **not suitable for** carrier detection.

Genetics Test Information

This test is used for the diagnosis of mucopolysaccharidoses (MPS) IIIB (Sanfilippo Syndrome type B) only.

Sanfilippo types A, C, and D must be ruled out independently.

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

Colorimetric

NY State Available

Yes

Specimen

Specimen Type

Serum

Specimen Required

Collection Container/Tube:

Preferred: Red top

Acceptable: Serum gel

Submission Container/Tube: Plastic vial

Specimen Volume: 1 mL

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 a Biochemical Genetics Test Request (T798) with the specimen.

Specimen Minimum Volume

0.8 mL

Reject Due To

Gross hemolysis	OK
Gross lipemia	OK
Gross icterus	OK

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Serum	Frozen	365 days	

Clinical and Interpretive

Clinical Information

The mucopolysaccharidoses (MPS) are a group of disorders caused by a deficiency of any of the enzymes involved in the stepwise degradation of dermatan sulfate, heparan sulfate, keratan sulfate, or chondroitin sulfate (glycosaminoglycans: GAG). Accumulation of GAG in lysosomes interferes with normal functioning of cells, tissues, and organs resulting in the clinical features observed in MPS disorders.

Sanfilippo syndrome (MPS type III) is an autosomal recessive MPS with 4 recognized types (A-D). Each type is caused by a deficiency in 1 of 4 enzymes involved in the degradation of heparan sulfate resulting in its lysosomal accumulation. Though biochemically different, the clinical presentation of all types is indistinguishable. Sanfilippo syndrome is characterized by severe central nervous system (CNS) degeneration, but other symptoms seen in MPS, such as coarse facial features and skeletal involvement, tend to be milder. Onset of clinical features usually occurs between 2 and 6 years in a child who previously appeared normal. The presenting symptoms are most commonly developmental delay and severe behavioral problems. Severe neurologic degeneration occurs in most patients by 6 to 10 years of age, accompanied by a rapid deterioration of social and adaptive skills. Death generally occurs by age 20, although individuals with an attenuated phenotype may have a longer life expectancy and remain functional into their third and fourth decades.

Sanfilippo syndrome type B is due to a deficiency of the enzyme *N*-acetyl-alpha-D-glucosaminidase (alpha-hexosaminidase), caused by variants in the *NAGLU* gene. Affected individuals demonstrate elevations of heparan sulfate in blood and urine (MPSBS / Mucopolysaccharidosis, Blood Spot and MPSQU/ Mucopolysaccharides Quantitative, Random, Urine). Diagnostic sequencing of the *NAGLU* gene (MP3BZ / Mucopolysaccharidosis IIIB, Full Gene Analysis, Varies) and deletion/duplication studies are available for patients with an enzyme deficiency.

Elevations in serum of alpha-N-acetylglucosaminidase and other hydrolases may be seen in patients with mucolipidosis II/III (I-cell disease).(1) I-cell disease is an autosomal recessive lysosomal storage disorder resulting in

impaired transport and phosphorylation of newly synthesized lysosomal proteins to the lysosome due to deficiency of N-acetylglucosamine 1-phosphotransferase (GlcNAc). Characteristic clinical features include short stature, skeletal and cardiac abnormalities, and developmental delay. Measurement of alpha-N-acetylglucosaminidase activity is not the preferred diagnostic test for I-cell disease but may be included in the testing strategy.

Reference Values

0.09-0.58 U/L

Interpretation

Deficiency of alpha-*N*-acetylglucosaminidase is diagnostic for Sanfilippo syndrome type B.

Cautions

This assay detects Sanfilippo syndrome type B only. The 3 other types of Sanfilippo syndrome (A, C, and D) must be ruled out independently.

This assay will not identify carrier status for Sanfilippo syndrome type B.

Clinical Reference

1. Braulke T, Raas-Rothschild A, Kornfeld S: I-cell disease and pseudo-Hurler polydystrophy: Disorders of lysosomal enzyme phosphorylation and localization. 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 May 24, 2021. Available at https://ommbid.mhmedical.com/content.aspx?bookid=2709&sectionid=225544648

2. Heron B, Mikaeloff Y, Froissart R, et al: Incidence and natural history of mucopolysaccharidosis type III in France and comparison with United Kingdom and Greece. Am J Med Genet A. 2011;155A(1):58-68. doi: 10.1002/ajmg.a.33779

3. Neufeld EF, Muenzer J: The mucopolysaccharidoses. In: Valle D, Beaudet AL, Vogelstein B, et al; eds. The Metabolic and Molecular Bases of Inherited Disease. McGraw-Hill; 2019. Accessed May 24, 2021. Available at https://ommbid.mhmedical.com/content.aspx?sectionid=225544161&bookid=2709

4. Valstar MJ, Bruggenwirth HT, Olmer R, et al: Mucopolysaccharidosis type IIIB may predominantly present with an attenuated clinical phenotype. J Inherit Metab Dis. 2010;33:759-767. doi: 10.1007/s10545-010-9199-y.

4. Beneto N, Vilageliu L, Grinberg D, Canals I: Sanfilippo syndrome: Molecular basis, disease models and therapeutic approaches. Int J Mol Sci. 2020;21(21):7819. doi: 10.3390/ijms21217819

Performance

Method Description

When *p*-nitrophenol alpha-D-glucosaminide is used as substrate, it is hydrolyzed by serum *N*-acetyl-alpha-D-glucosaminidase to yield *p*-nitrophenol and free *N*-acetyl-glucosamine. *p*-Nitrophenol is subsequently measured spectrophotometrically at a basic pH.(von Figura K, Logering M, Mersmann G, Kress H: Sanfilippo B disease: serum assays for detection of homozygous and heterozygous individuals in three families. J Pediatr. 1973;83:607-611. doi: 10.1016/s0022-3476(73)80222-7; 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. McGraw-Hill; 2017:1139-1158)

PDF Report

No

Day(s) Performed

Varies

Report Available

30 to 45 days

Specimen Retention Time

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 US Food and Drug Administration.

CPT Code Information

84311

LOINC® Information

Test ID	Test Order Name	Order LOINC Value
ANAS	Alpha-N-Acetylglucosaminidase, S	1837-4

Result ID	Test Result Name	Result LOINC Value
50564	Specimen	31208-2
50565	Specimen ID	57723-9
50566	Source	31208-2
50567	Order Date	82785-7
50568	Reason For Referral	42349-1
50569	Method	85069-3
50577	Alpha-N-Acetylglucosaminidase, S	1837-4
50570	Interpretation	59462-2
50571	Amendment	48767-8
50572	Reviewed By	18771-6
50573	Release Date	82772-5