MAYO CLINIC LABORATORIES

Test Definition: OLIGU

Oligosaccharide Screen, Random, Urine

Overview

Useful For
Screening for selected oligosaccharidosis

Genetics Test Information
Oligosaccharidoses are characterized by the abnormal accumulation of incompletely degraded oligosaccharides in cells and tissues and the corresponding increase of related free oligosaccharides in the urine.

Clinical features of the oligosaccharidoses often overlap; therefore, urine screening is an important tool in the initial workup for these disorders.

Enzyme or molecular analysis is required to make a definitive diagnosis.

Testing Algorithm
Oligosaccharide analysis may be considered in the workup of unexplained refractory epilepsy. For more information see:
-Epilepsy: Unexplained Refractory and/or Familial Testing Algorithm
-Congenital Disorders of Glycosylation: Screening Algorithm

Special Instructions
- Biochemical Genetics Patient Information
- Epilepsy: Unexplained Refractory and/or Familial Testing Algorithm
- Congenital Disorders of Glycosylation: Screening Algorithm
- Congenital Disorders of Glycosylation Patient Information

Method Name
Matrix-Assisted Laser Desorption/Ionization Time-of-Flight Mass Spectrometry (MALDI-TOF MS)

NY State Available
Yes

Specimen

Specimen Type
Urine

Ordering Guidance
This is the recommended test when clinical features are suggestive of, or when molecular testing results suggest, an oligosaccharidosis disorder that can be identified by this test.

The recommended screening test for the initial workup of a suspected lysosomal storage disorder, particularly when

clinical features are nonspecific, is LSDS / Lysosomal Storage Disorders Screen, Random, Urine.

Necessary Information

1. Patient's age is required.

2. Biochemical Genetics Patient Information (T602) is recommended. This information aids in providing a more thorough interpretation of results. Send information with specimen.

Specimen Required

Supplies: Urine Tubes, 10 mL (T068)
Container/Tube: Plastic, 10-mL urine tube
Specimen Volume: 8 mL
Pediatric Volume: 2 mL
Collection Instructions:
1. Collect a random urine specimen.
2. No preservative
3. Immediately freeze specimen.

Forms

1. Biochemical Genetics Patient Information (T602)
2. If not ordering electronically, complete, print, and send a Biochemical Genetics Test Request (T798) with the specimen.

Specimen Minimum Volume

2.5 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	Ambient	7 days	
	Refrigerated	15 days	
	Frozen (preferred)	365 days	

Clinical & Interpretive

Clinical Information

The oligosaccharidoses (glycoproteinoses) are a subset of lysosomal storage disorders (LSD) caused by the deficiency of any one of the lysosomal enzymes involved in the degradation of complex oligosaccharide chains. They are characterized by the abnormal accumulation of incompletely degraded oligosaccharides in cells and tissues and the corresponding increase of related free oligosaccharides in the urine. Clinical diagnosis can be difficult due to the similarity of clinical features across disorders and their variable severity. Clinical features can include bone abnormalities, coarse facial features, corneal cloudiness, organomegaly, muscle weakness, hypotonia, developmental delay, and ataxia. Age of onset

ranges from early infancy to adult and can also present prenatally.

The oligosaccharidoses and other storage disorders detected by this assay include alpha-mannosidosis, beta-mannosidosis, aspartylglucosaminuria, fucosidosis, Schindler disease, GM1 gangliosidosis, Sandhoff disease, sialidosis, galactosialidosis, mucolipidoses types II and III, mucopolysaccharidosis IVA (Morquio A), mucopolysaccharidosis IVB (Morquio B), and Pompe disease (see Table). Additional conditions that may be picked up by this test include other mucopolysaccharidoses, Gaucher disease, and some congenital disorders of glycosylation (PMM2, NGLY1, MOGS, ALG1).

Table. **Conditions Identifiable by Test**

Disorder	Onset	Gene	Enzyme deficiency	Worldwide incidence
Alpha-mannosidosis	Prenatal (type III) Infancy (type I) Juvenile/Adult (type II)	*MAN2B1*	Alpha-mannosidase	1:500,000
	Phenotype: Continuum of clinical features ranging from severe and rapidly progressive disease to a milder and more slowly progressive course. Prenatal onset (type III) manifests as prenatal loss or early death from progressive neurodegeneration. Infantile onset (type I) is characterized by rapidly progressive intellectual disability, hepatosplenomegaly, and severe dysostosis multiplex. Type II is milder and slower progressing with survival into adulthood.			
Beta-mannosidosis	Infancy to juvenile	*MANBA*	Beta-mannosidase	<100 patients described
	Phenotype: Clinical features vary in severity and may include intellectual disability, respiratory infections, hearing loss, hypotonia, peripheral neuropathy, and behavioral issues.			
Aspartylglucosaminuria	Early childhood	*AGA*	Aspartylglucosaminidase	1:2,000,000 higher incidence in Finland approx 1:17,000
	Phenotype: Normal appearing at birth followed by progressive neurodegeneration between 2 to 4 years, frequent respiratory infections, coarse features, thick calvarium, and osteoporosis. Slowly progressive mental decline into adulthood.			
Alpha-fucosidosis	Infancy to early childhood	*FUCA1*	Alpha-fucosidase	<100 patients described
	Phenotype: Continuum within a wide spectrum of severity; clinical features include neurodegeneration, coarse facial features, growth delay, recurrent infections, dysostosis multiplex, angiokeratoma, and elevated sweat chloride.			
Schindler disease	Infancy (type I) Early childhood (type III) Adult (type II)	*NAGA*	Alpha-N-acetyl-galactosaminidase	<30 patients described
	Phenotype: Continuum of clinical features ranging from severe and rapidly progressive disease to a milder and more slowly progressive course; infantile onset (type I) is			

	characterized by rapidly progressive neurodegeneration. Type II is adult onset characterized by angiokeratoma and mild cognitive impairment, and type III is an intermediate and variable form ranging from seizures and psychomotor delay to milder autistic features.			
GM1 gangliosidosis	Infancy (type I) Late infantile/juvenile (type II) Adult (type III)	*GLB1*	Beta-galactosidase (beta-Gal)	1:200,000
	Phenotype: Continuum of clinical features ranging from severe and rapidly progressive disease to a milder and more slowly progressive course; infantile onset (type I) is characterized by early developmental delay/arrest followed by progressive neurodegeneration, skeletal dysplasia, facial coarseness, hepatosplenomegaly, and macular cherry red spot. Later onset forms (types II and III) are milder and observed as progressive neurologic disease and vertebral dysplasia. Adult onset presents mainly with dystonia.			
GM2 gangliosidosis variant 0 (Sandhoff disease)	Early infancy to juvenile or adult	*HEXB*	Beta-hexosaminidase A and B	1:400,000
	Phenotype: Infantile onset is characterized by rapidly progressive neurodegeneration, exaggerated startle reflex, "cherry red spot". Milder later adult-onset forms of the disease exist presenting with neurological problems, such as ataxia, dystonia, spinocerebellar degeneration, and behavior changes.			
Sialidosis (ML I)	Early adulthood (type I) Earlier for congenital, infantile, and juvenile forms (type II)	*NEU1*	Alpha-neuraminidase (Neu)	<30 patients described
	Phenotype: Continuum of clinical features ranging from severe disease (type II) to a milder and more slowly progressive course (type I). Clinical features range from early developmental delay, coarse facial features, short stature, dysostosis multiplex, and hepatosplenomegaly to late onset cherry-red spot myoclonus syndrome. Seizures, hyperreflexia, and ataxia have been reported in more than 50% of later-onset patients. A congenital form of the disease has been reported in which patients present with fetal hydrops or neonatal ascites.			
Galactosialidosis	Early infancy, late infancy, or early adult	*CTSA*	Cathepsin A causing secondary deficiencies in beta-Gal and Neu	<30 patients described
	Phenotype: Continuum of clinical features ranging from severe and rapidly progressive disease to a milder and more slowly progressive course; clinical features of the early infantile type include fetal hydrops, edema, ascites, visceromegaly, dysostosis			

	multiplex, coarse facies, and cherry red spot. The majority of patients have milder presentations, which include ataxia, myoclonus, angiokeratoma, cognitive and neurologic decline.			
Mucolipidosis II-alpha/-beta (I-cell) Mucolipidosis III-alpha/-beta and III-gamma (pseudo-Hurler polydystrophy)	Early infancy Early childhood, may live well into adulthood	*GNPTAB*(alpha/beta) *GNPTG* (gamma)	N-acetylglucosaminyl-1-phosphotransferase deficiency causing secondary intracellular deficiency of multiple enzyme activities	1:300,000
	Phenotype: I-cell resembles Hurler with short stature and skeletal anomalies, but presents earlier, is more severe, and can include cardiomyopathy and coronary artery disease. Pseudo-Hurler polydystrophy is milder and later presenting.			
Mucopolysaccharidosis IVB (Morquio B)	Infancy to adult	*GLB1*	Beta-Gal	1:75,000 N. Ireland 1:640,000 W. Australia
	Phenotype: Progressive condition that largely affects the skeletal system. Features include short-trunk dwarfism, skeletal (spondyloepiphyseal) dysplasia, fine corneal deposits, and preservation of intelligence.			
Pompe disease (glycogen storage disease type II)	Early infancy Late onset (childhood-adult)	*GAA*	Alpha-glucosidase	1:40,000
	Phenotype: Infantile onset is characterized by prominent cardiomegaly, hepatomegaly, hypotonia, and weakness. Later onset forms present with proximal muscle weakness and respiratory insufficiency.			

Reference Values

An interpretive report will be provided.

Interpretation

This is a screening test; not all oligosaccharidoses are detected. The resulting excretion profile may be characteristic of a specific disorder; however, abnormal results require confirmation by enzyme assay or molecular genetic testing.

When abnormal results are detected with characteristic patterns, a detailed interpretation is given, including an overview of results and significance, a correlation to available clinical information, elements of differential diagnosis, recommendations for additional confirmatory studies (enzyme assay, molecular genetic analysis).

Cautions

This test may give false-negative results, especially in older patients with mild clinical presentations.

This test may give false-positive results for Pompe disease, especially in pediatric patients on infant formula.

Clinical Reference

1. Neufeld EF, Muenzer J. The mucopolysaccharidoses. 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 January 18, 2024. Available at https://ommbid.mhmedical.com/content.aspx?bookId=2709&sectionId=225544161
2. Thomas GH. Disorders of glycoprotein degradation: Alpha-mannosidosis, beta-mannosidosis, fucosidosis, and sialidosis. 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 January 17, 2024. Available at https://ommbid.mhmedical.com/content.aspx?bookid=2709&sectionid=225545029
3. Enns GM, Steiner RD, Cowan TM. Lysosomal disorders. In: Sarafoglou K, Hoffmann GF, Roth KS, eds. Pediatric Endocrinology and Inborn Errors of Metabolism. McGraw Hill Medical; 2009

Performance

Method Description

Urine samples are extracted using Oasis HLB and carbograph columns and lyophilized overnight. Oligosaccharides are permethylated, replacing all hydroxy groups (-OH) with methoxy groups (-OCH3) and esterifies carboxyl groups (-COOH to -COOCH3). After permethylation, the tubes are centrifuged, and the supernatant removed from the sodium hydroxide pellet. The supernatant is quenched, neutralized, extracted onto an Oasis HLB column, eluted, and lyophilized again overnight. Specimens are resuspended, mixed with a matrix solution containing 2,5-dihydroxybenzoic acid, spotted onto a MALDI plate, and allowed to air dry. The plate is then analyzed using a matrix-assisted laser desorption/ionization tandem time-of-flight (MALDI TOF/TOF) 5800 Analyzer.(Xia B, Asif G, Arthur L, et al. Oligosaccharide analysis in urine by MALDI-TOF mass spectrometry for the diagnosis of lysosomal storage diseases. Clin Chem. 2013;59[9]:1357-1368, Hall PL, Lam C, Alexander JJ. Urine oligosaccharide screening by MALDI-TOF for the identification of NGLY1 deficiency. Mol Genet Metab. 2018;124[1]:82-86)

PDF Report

No

Day(s) Performed

Monday

Report Available

8 to 15 days

Specimen Retention Time

1 month

Performing Laboratory Location

Rochester

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.

CPT Code Information

84377

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
OLIGU	Oligosaccharide Screen, U	49284-3

Result ID	Test Result Name	Result LOINC® Value
64889	Oligosaccharide Screen, U	49284-3