MAYO CLINIC LABORATORIES

Test Definition: GPSY

Glucopsychosine, BS

Overview

Useful For

Second-tier test when newborn screening results with reduced beta-glucosidase (GBA) activity are identified
Diagnosis and monitoring of patients with Gaucher disease using dried blood spot specimens
Monitoring a patient's response to treatment
This test is **not useful for** identifying carriers of *GBA* variants.

Genetics Test Information

Gaucher disease is an autosomal recessive lysosomal storage disorder caused by deficient beta-glucosidase activity. There are 3 described types of Gaucher disease with varying clinical presentations generally distinguished based on whether there is central nervous system involvement.
Glucopsychosine (glucosylsphingosine: lyso-GL1) is elevated in symptomatic patients and supports a diagnosis of Gaucher disease.

Testing Algorithm

See Newborn Screen Follow-up for Gaucher Disease
For more information, see Newborn Screening Act Sheet Gaucher Disease: Decreased Acid Beta-Glucosidase

Special Instructions

- Biochemical Genetics Patient Information
- Blood Spot Collection Card-Spanish Instructions
- Newborn Screening Act Sheet Gaucher Disease: Decreased Acid Beta-Glucosidase
- Newborn Screen Follow-up for Gaucher Disease
- Blood Spot Collection Card-Chinese Instructions
- Blood Spot Collection Instructions

Method Name

Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS)

NY State Available

Yes

Specimen

Specimen Type

Whole blood

Ordering Guidance

This test is available separately as well as a part of HSMBS / Hepatosplenomegaly Panel, Blood Spot. If this test is ordered with either CTXBS / Cerebrotendinous Xanthomatosis, Blood Spot or OXYBS / Oxysterols, Blood Spot, the individual tests will be canceled and HSMBS ordered.

Specimen Required

Supplies:

-Card-Blood Spot Collection (Filter Paper) (T493)
-Card-Postmortem Screening (Filter Paper) (T525)
Collection Container/Tube:
Preferred: Blood Spot Collection (Filter Paper)
Acceptable: Whatman Protein Saver 903 filter paper, PerkinElmer 226 (formerly Ahlstrom 226) filter paper, Munktell filter paper, Postmortem Screening card, or collected with heparin or EDTA containing
Specimen Volume: 2 Blood spots
Collection Instructions:
1. Let blood dry completely on filter paper at ambient temperature in a horizontal position for a minimum of 3 hours.
2. At least 1 spot should be complete, (ie, unpunched)
3. Do not expose specimen to heat or direct sunlight.
4. Do not stack wet specimens.
5. Keep specimen dry.
Additional Information:
1. For collection instructions, see Blood Spot Collection Instructions
2. For collection instructions in Spanish, see Blood Spot Collection Card-Spanish Instructions (T777)
3. For collection instructions in Chinese, see Blood Spot Collection Card-Chinese Instructions (T800)

Forms

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

Reject Due To

Blood spot showing serum rings	Insufficient specimen	Layering Multiple applications	Reject

Specimen Minimum Volume

Blood spot: 1

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Whole blood	Refrigerated (preferred)	10 days	FILTER PAPER
	Frozen	59 days	FILTER PAPER
	Ambient	10 days	FILTER PAPER

Clinical & Interpretive

Clinical Information

Gaucher disease is an autosomal recessive lysosomal storage disorder caused by a deficiency of the enzyme, beta-glucosidase, which facilitates the lysosomal degradation of glucosylceramide (glucocerebroside) and glucopsychosine (glucosylsphingosine: lyso-GL1). Gaucher disease is caused by variants in the *GBA* gene. There are 3 described types of Gaucher disease with varying clinical presentations and age of onset from a perinatal lethal disorder to a mildly symptomatic type. Features of all types of Gaucher disease include hepatosplenomegaly and hematological abnormalities.

Gaucher disease type I is the most common form, representing more than 90% of cases. It is generally characterized by bone disease, hepatosplenomegaly, anemia and thrombocytopenia, coagulation abnormalities, lung disease, but no central nervous system involvement. Gaucher disease types II and III are characterized by the presence of primary neurologic disease. In addition, Type II typically presents with limited psychomotor development, hepatosplenomegaly, and lung disease, resulting in death usually between 2 and 4 years of age. Individuals with Gaucher disease type III may present prior to 2 years of age, but the progression is not as rapid, and patients may survive into the third and fourth decade. Further subtypes of Gaucher disease include a perinatal lethal form associated with skin abnormalities and nonimmune hydrops fetalis, and a cardiovascular form presenting with calcification of the aortic and mitral valves, mild splenomegaly, corneal opacities, and gaze impairment.

Treatment is available in the form of enzyme replacement therapy or substrate reduction therapy for types I and III. These treatment options have generally made bone marrow transplantation obsolete. Currently, only supportive therapy is available for type II because of the inability of enzyme provided by replacement therapy to cross the blood-brain barrier.

The incidence of Gaucher disease type I ranges from 1 in 30,000 to 1 in 100,000 in the general population but is much more frequent among Ashkenazi Jews with an incidence of approximately 1 in 900. Types II and III both have an incidence of approximately 1 in 100,000 in the general population.

A diagnostic workup for Gaucher disease may demonstrate the characteristic finding of Gaucher cells on bone marrow examination, other hematologic abnormalities, and hepatosplenomegaly. The diagnosis can be confirmed by the demonstration of reduced or absent acid beta-glucosidase activity in leukocytes (GBAW / Beta-Glucosidase, Leukocytes) or dried blood spots (PLSD / Lysosomal and Peroxisomal Storage Disorders Screen, Blood Spot) and molecular genetic analysis of the *GBA* gene (GAUP / Gaucher Disease, Mutation Analysis, *GBA,* Varies*;* or GBAZ / Gaucher Disease, Full Gene Analysis, Varies). Lyso GL-1 is a sensitive and specific biomarker for Gaucher disease, and an elevation of lyso GL-1 in blood supports the diagnosis. Lyso GL-1 has also been shown to be helpful in monitoring mildly symptomatic individuals for disease progression and in determining treatment response.

Reference Values

Cutoff: < or =0.040 nmol/mL

Interpretation

An elevation of glucopsychosine (glucosylsphingosine: lyso-GL1) is indicative of Gaucher disease.

Cautions

Some patients with Gaucher disease may have normal concentrations of glucopsychosine (lyso-GL1).

Clinical Reference

1. Pastores GM, Hughes DA: Gaucher disease. In: Adam MP, Ardinger HH, Pagon RA, et al, eds. GeneReviews [Internet]. University of Washington, Seattle; 2000. Updated June 21, 2018. Accessed September 28, 2020. Available at www.ncbi.nlm.nih.gov/books/NBK1269/

2. Kaplan P, Baris H, De Meirleir L, et al: Revised recommendations for the management of Gaucher disease in children. Eur J Pediatr. 2013 Apr;172(4):447-458

3. Grabowski GA, Petsko GA, Kolodny EH: : Gaucher disease. In: Valle DL, Antonarakis S, Ballabio A, Beaudet AL, Mitchell GA, eds. The Online Metabolic and Molecular Bases of Inherited Disease. McGraw-Hill Education; 2019. Accessed February 4, 2021. Available at https://ommbid.mhmedical.com/content.aspx?sectionid=225546056&bookid=2709

4. Murugeasan V, Chuan WL, Liu J, et al: Glucosylsphingosine is a key biomarker of Gaucher disease. Am J Hematol. 2016 Nov;91(11)1082-1089

5. Arkadir D, Dinur T, Revel-Vilk S, et al: Glucosylsphingosine is a reliable response biomarker in Gaucher disease. Am J Hematol. 2018 Jun;93(6):E140-E142. doi: 10.1002/ajh.25074

6. Saville JT, McDermott BK, Chin SJ, Fletcher JM, Fuller M: Expanding the clinical utility of glucosylsphingosine for Gaucher disease. J Inherit Metab Dis. 2020 May;43(3):558-563

Performance

Method Description

A 3-mm dried blood spot is extracted with internal standard. The extract is subjected to liquid chromatography-tandem mass spectrometry (LC-MS/MS) analysis. The MS/MS is operated in the multiple reaction monitoring positive mode to follow the precursor to product species transitions for each analyte and internal standard. The ratio of the extracted peak areas to internal standard is determined by LC-MS/MS is used to calculate the concentration of in the sample.(Unpublished Mayo method)

PDF Report

No

Specimen Retention Time

Normal results: 2 months;, Abnormal results: Indefinitely

Performing Laboratory Location

Rochester

Fees & Codes

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

82542