MAYO CLINIC LABORATORIES

Test Definition: GPSY

Glucopsychosine, Blood Spot

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 *GBA1* 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

For more information see Newborn Screen Follow-up for Gaucher Disease

If the patient has abnormal newborn screening results for Gaucher disease, refer to the appropriate American College of Medical Genetics and Genomics Newborn Screening ACT Sheet.(1)

Special Instructions

- Biochemical Genetics Patient Information
- Blood Spot Collection Card-Spanish Instructions
- 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 also available as a part of a panel; see HSMBS / Hepatosplenomegaly Panel, Blood Spot. If this test (GPSY) 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 Card (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 filter paper, Munktell filter paper, Postmortem Screening card, or collected with sodium heparin, lithium heparin, ACD-B or EDTA containing devices

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

Specimen Minimum Volume

1 Blood spot

Reject Due To

Blood spot specimen that shows serum rings or has multiple layers	Reject
Insufficient specimen	Reject

Specimen Stability Information

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

Clinical & Interpretive

Clinical Information

Gaucher disease (GD) 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 disease-causing variants in the *GBA1* gene and presents with a markedly variable phenotype, ranging from a perinatal lethal disorder to mildly symptomatic. It has historically been categorized into 3 types (GD1, GD2 and GD3) based on the presence and progression of neuropathic features. 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, although in practice, assigning a type in infancy can sometimes be challenging due to overlapping clinical features. 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 (ERT) or substrate reduction therapy (SRT) for types I and III. Some patients with chronic and progressive neurologic symptoms despite ERT or SRT may be candidates for bone marrow transplant or a multifaceted approach. 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 GD is variable, with a higher occurrence in populations with known founder variants such as the Ashkenazi Jewish population.

A diagnostic workup for GD 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 Disorders Screen, Blood Spot) and molecular genetic analysis of the *GBA1* gene (GBA / Gaucher Disease, *GBA1* Gene Sequencing with Deletion/Duplication, 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. Newborn Screening ACT Sheet [Decreased beta-glucocerebrosidase] Gaucher Disease. American College of Medical Genetics and Genomics; 2022. Revised March 2022. Accessed November 14, 2024. Available at www.acmg.net/PDFLibrary/Gaucher.pdf
2. Hughes DA, Pastores GM. Gaucher disease. In: Adam MP, Feldman J, Mirzaa GM, et al. eds. GeneReviews. [Internet]. University of Washington, Seattle; 2000. Updated December 7, 2023. Accessed November 14, 2024. Available at www.ncbi.nlm.nih.gov/books/NBK1269/
3. Kishnani PS, Al-Hertani W, Balwani M, et al. Screening, patient identification, evaluation, and treatment in patients with Gaucher disease: Results from a Delphi consensus. Mol Genet Metab. 2022;135(2):154-162. doi:10.1016/j.ymgme.2021.12.009
4. 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 November 14, 2024. Available at https://ommbid.mhmedical.com/content.aspx?sectionid=225546056&bookid=2709
5. Murugesan V, Chuan WL, Liu J, et al. Glucosylsphingosine is a key biomarker of Gaucher disease. Am J Hematol. 2016;91(11)1082-1089
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;43(3):558-563
7. Daykin EC, Ryan E, Sidransky E. Diagnosing neuronopathic Gaucher disease: New considerations and challenges in assigning Gaucher phenotypes. Mol Genet Metab. 2021;132(2):49-58. doi:10.1016/j.ymgme.2021.01.002

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 determined by the LC-MS/MS is used to calculate the concentration of in the sample.(Unpublished Mayo method)

PDF Report
No

Day(s) Performed
Tuesday, Thursday

Report Available
3 to 7 days

Specimen Retention Time
Normal results: 2 months; Abnormal results: Indefinitely

Performing Laboratory Location
Mayo Clinic Laboratories - Rochester Main Campus

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
82542

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
GPSY	Glucopsychosine, BS	92752-5

Result ID	Test Result Name	Result LOINC® Value
62236	Glucopsychosine	92752-5
36344	Reviewed By	18771-6
36345	Interpretation (GPSY)	59462-2