Test Definition: GBAW

Beta-Glucosidase, Leukocytes

Overview

Useful For

Diagnosis of Gaucher disease

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

Genetics Test Information

This test provides diagnostic testing for patients with clinical signs and symptoms suspicious for Gaucher disease.

Enzyme testing is included in the diagnostic workup for infants following a positive newborn screen result for Gaucher disease.

Testing Algorithm

For additional 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

- Informed Consent for Genetic Testing
- Biochemical Genetics Patient Information
- Newborn Screen Follow-up for Gaucher Disease
- Informed Consent for Genetic Testing (Spanish)

Method Name

Flow Injection Analysis-Tandem Mass Spectrometry (FIA-MS/MS)

NY State Available

Yes

Specimen

Specimen Type

Whole Blood ACD

Ordering Guidance

This test is preferred for diagnostic testing but does not reliably detect carriers. For carrier detection, order GBA / Gaucher Disease, *GBA1* Gene Sequencing with Deletion/Duplication, Varies). Call 800-533-1710 to discuss testing options.

Shipping Instructions

For optimal isolation of leukocytes, it is recommended the specimen arrive refrigerated within 6 days of collection to be stabilized. Pre-analytical processing is performed Monday through Friday and Sunday. This test may be canceled if specimens are outside of stability when processing occurs. Collect and package specimens for arrival on days when processing is performed.

Specimen Required

Container/Tube:
Preferred: Yellow top (ACD solution B)
Acceptable: Yellow top (ACD solution A) or lavender top (EDTA)
Specimen Volume: 6 mL
Collection Instructions: Send specimen in whole blood original tube. **Do not aliquot**.

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:
-Informed Consent for Genetic Testing (T576)
-Informed Consent for Genetic Testing-Spanish (T826)
2. Biochemical Genetics Patient Information (T602)
3. If not ordering electronically, complete, print, and send a Biochemical Genetics Test Request (T798) with the specimen.

Specimen Minimum Volume

4 mL

Reject Due To

Gross hemolysis	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Whole Blood ACD	Refrigerated (preferred)	6 days	
	Ambient	6 days	

Clinical & Interpretive

Clinical Information

Gaucher disease (GD) is an autosomal recessive lysosomal disorder caused by reduced or absent acid beta-glucosidase (glucocerebrosidase) enzyme activity resulting in accumulation of glucosylceramide (glucocerebroside) and glucopsychosine (glucosylsphingosine) in the lysosomes. This interferes with the normal functioning of cells and leads to clinical abnormalities characteristic of the disease.

While clinical features and severity of symptoms are widely variable within Gaucher disease, common features include abnormal blood parameters such as decreased red blood cells (anemia) and/or platelets (thrombocytopenia), bone

disease, and hepatosplenomegaly. Three clinical subtypes have been identified based on the presence and progression of central nervous system (CNS) involvement. Type 1 is the most common type, representing 95% of all cases, and is generally characterized by bone disease, hepatosplenomegaly, anemia and thrombocytopenia, coagulation abnormalities, lung disease, and no CNS involvement. Type 2 or acute neuronopathic (GD2), typically has a very severe progression with onset in the first 2 years of life including neurologic disease, hepatosplenomegaly, and lung disease, with death usually between 2 and 4 years due to lung failure. Individuals with type 3 or chronic neuronopathic (GD3) may have onset prior to 2 years of age, but the progression is not as severe, and they may survive into the third and fourth decade. Finally, within the spectrum, there is 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, and corneal opacities.

Treatment is available in the form of enzyme replacement therapy (ERT), substrate reduction therapy, and chaperone therapy for types 1 and 3. Individuals with type 3 may benefit from bone marrow transplantation. Currently, only supportive therapy is available for type 2. Emerging therapies currently listed at Clinicaltrials.gov include gene therapy and in utero ERT.

The incidence of type 1 ranges from 1 in 20,000 to 200,000 in the general population, but it is much more frequent among Ashkenazi Jewish population with an incidence between 1 in 400 and 900. Types 2 and 3 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. Significantly reduced or absent enzyme activity of acid beta-glucosidase along with elevation of the biomarker, glucopsychosine (GPSY / Glucopsychosine, Blood Spot; GPSYP / Glucopsychosine, Plasma; GPSYW / Glucopsychosine, Blood) is diagnostic. Molecular analysis of the *GBA1* gene allows for detection of disease-causing variants in affected patients (GBA / Gaucher Disease, *GBA1* Gene Sequencing with Deletion/Duplication, Varies).

Reference Values

> or =2.88 nmol/hour/mg protein
An interpretative report will be provided.
Note: Results from this assay do not reflect carrier status because of individual variation of beta-glucosidase enzyme levels.

Interpretation

Individuals affected with Gaucher disease will have enzyme levels less than 2.88 nmol/h/mg protein. In our experience some carriers will also have less than 2.88 nmol/h/mg protein activity.

Cautions

Enzyme levels may be normal in individuals receiving enzyme replacement therapy.

Clinical Reference

1. Newborn Screening ACT Sheet [Decreased beta-glucocerebrosidase] Gaucher Disease. American College of Medical Genetics and Genomics; 2022. Revised March 2022. Accessed June 10, 2024. Available at www.acmg.net/PDFLibrary/Gaucher.pdf
2. Martins AM, Valadares ER, Porta G, et al. Recommendations on diagnosis, treatment, and monitoring for Gaucher disease. J Pediatr. 2009;155(4 Suppl):S10-S18
3. 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
4. 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 March 1, 2022. Available at www.ncbi.nlm.nih.gov/books/NBK1269/
5. Weinreb NJ, Andersson HC, Banikazemi M, et al. Prevalence of type 1 Gaucher disease in the United States. Arch Intern Med. 2008;168:326-328
6. Elliott S, Buroker N, Cournoyer JJ, et al. Pilot study of newborn screening for six lysosomal storage diseases using tandem mass spectrometry. Mol Genet Metab. 2016;118(4):304-309

Performance

Method Description
The specimens are incubated with a mix of substrate and internal standard for acid sphingomyelinase, beta-glucocerebrosidase, acid alpha-glucosidase, alpha-galactosidase, galactocerebrosidase and alpha-L-iduronidase. The sample is then purified by liquid-liquid extraction. The extract is evaporated and reconstituted before analysis by tandem mass spectrometry.(Unpublished Mayo method)

PDF Report
No

Day(s) Performed
Preanalytical processing: Monday through Friday, Sunday
Testing performed: Monday, Thursday

Report Available
2 to 5 days

Specimen Retention Time
White blood cell homogenate: 1 month

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

82963

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
GBAW	Beta-Glucosidase, Leukocytes	32540-7

Result ID	Test Result Name	Result LOINC® Value
606273	Beta-Glucosidase, Leukocytes	32540-7
606274	Interpretation	59462-2
606275	Reviewed By	18771-6