MAYO CLINIC LABORATORIES

Test Definition: GAAWR

Acid Alpha-Glucosidase Reflex, Leukocytes

Overview

Useful For

Diagnosis of Pompe disease as a confirmatory reflex of the 6-enzyme panel

Method Name

Only orderable as a reflex. For more information see LSD6W / Lysosomal Disorders, Six-Enzyme Panel, Leukocytes.

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

NY State Available

Yes

Specimen

Specimen Type

Whole Blood ACD

Specimen Required

Only orderable as a reflex. For more information see LSD6W / Lysosomal Disorders, Six-Enzyme Panel, Leukocytes.

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 whole blood specimen in original tube. **Do not aliquot**.

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

Pompe disease, also known as glycogen storage disease type II, is an autosomal recessive disorder caused by a deficiency of the lysosomal enzyme acid alpha-glucosidase (GAA; acid maltase) due to variants in the *GAA* gene. The estimated incidence is 1 in 40,000 live births. In Pompe disease, glycogen that is taken up by lysosomes during physiologic cell turnover accumulates, causing lysosomal swelling, cell damage, and organ dysfunction. This leads to progressive muscle weakness, cardiomyopathy, and eventually, death. Individuals with Pompe disease, especially those with infantile, childhood, and juvenile onset, can have elevations of serum enzymes (eg, creatine kinase) secondary to cellular dysfunction.

The clinical phenotype of Pompe disease lies on a spectrum dependent on age of onset and residual enzyme activity. Complete loss of enzyme activity causes onset in infancy leading to death, typically within the first year of life when left untreated. Juvenile and adult-onset forms, as the names suggest, are characterized by later onset and longer survival. All disease variants are eventually associated with progressive muscle weakness and respiratory insufficiency.

Cardiomyopathy is associated almost exclusively with the infantile form. Treatment with enzyme replacement therapy is available, making early diagnosis of Pompe disease desirable, as early initiation of treatment may improve prognosis. Newborn screening can identify individuals with all forms of Pompe disease, even before onset of symptoms. Unaffected individuals with GAA pseudodeficiency alleles and carriers may also be identified by newborn screening.

Determination of GAA enzyme activity in leukocytes can help distinguish between infantile and later onset Pompe disease, but it may also be deficient in individuals with pseudodeficiency alleles and in some carriers. Urine glucotetrasaccharides (HEX4 / Glucotetrasaccharides, Random, Urine) have been shown to be elevated in some individuals, particularly those with infantile onset, and may aid in the initial diagnosis and treatment monitoring.

Molecular genetic analysis of the *GAA* gene (GAAN / Pompe Disease, *GAA* Gene Sequencing with Deletion/Duplication, Varies) is necessary for differentiating alterations from disease-causing variants in affected individuals and for carrier detection in family members.

Reference Values

Only orderable as a reflex. For more information see LSD6W / Lysosomal Disorders, Six-Enzyme Panel, Leukocytes.

> or =1.500 nmol/hour/mg protein

Interpretation

When abnormal results are detected, a detailed interpretation is given, including an overview of the results and of their significance, a correlation to available clinical information, elements of differential diagnosis, recommendations for additional biochemical testing and in vitro, confirmatory studies (enzyme assay, molecular analysis), and a phone number to reach one of the laboratory directors in case the referring physician has additional questions.

Cautions

Pseudodeficiency results in low measured acid alpha-glucosidase activity, but it is not consistent with Pompe disease. Molecular analysis (GAAN / Pompe Disease, *GAA* Gene Sequencing with Deletion/Duplication, Varies) should be performed to resolve the clinical question.

Additional biochemical or molecular testing is recommended to confirm a diagnosis if enzyme deficiency is detected by this screening test.

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

Clinical Reference

1. 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. doi:10.1016/j.ymgme.2016.05.015
2. Matern D, Gavrilov D, Oglesbee D, Raymond K, Rinaldo P, Tortorelli S. Newborn screening for lysosomal storage disorders. Semin Perinatol. 2015;39(3):206-216. doi:10.1053/j.semperi.2015.03.005
3. Reuser AJ, Hirschhorn R, Kroos MA: Pompe disease: Glycogen storage disease type II, acid a-glucosidase (acid maltase) deficiency. In: Valle DL, Antonarakis S, Ballabio A, Beaudet AL, Mitchell GA. eds. Online Metabolic and Molecular Bases of Inherited Disease. McGraw-Hill; 2019. Accessed July 22, 2025. Available at: https://ommbid.mhmedical.com/content.aspx?bookid=2709&sectionid=225890450
4. Lin N, Huang J, Violante S, et al. Liquid chromatography-tandem mass spectrometry assay of leukocyte acid alpha-glucosidase for post-newborn screening evaluation of Pompe disease. Clin Chem. 2017;63(4):842-851. doi:10.1373/clinchem.2016.259036
5. Leslie N, Bailey L: Pompe disease. In: Adam MP, Ardinger HH, Pagon RA, et al, eds. GeneReviews [Internet]. University of Washington, Seattle; 2007. Updated November 2, 2023. Accessed July 22, 2025. Available at www.ncbi.nlm.nih.gov/books/NBK1261/

Performance

Method Description

The specimens are incubated with a mix of substrate and internal standard for acid alpha-glucosidase and alpha-galactosidase (GLA). The reaction is then stopped using acetonitrile, centrifuged, and a portion of the supernatant is prepared for analysis by liquid chromatography-tandem mass spectrometry. GLA is included to verify sample integrity.(Unpublished Mayo method)

PDF Report

No

Day(s) Performed

Preanalytical processing: Monday through Saturday.
Assay performed: Monday, Wednesday

Report Available

4 to 10

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

82542