Test Definition: GAAW

Acid Alpha-Glucosidase, Leukocytes

Overview

Useful For

Diagnosis of Pompe disease

Genetics Test Information

This test provides diagnostic testing for individuals with decreased alpha-glucosidase activity on newborn screen or clinical signs and symptoms suspicious for Pompe disease.

Testing Algorithm

The following are available in Special Instructions:

-Newborn Screen Follow-up for Pompe Disease

-Newborn Screening Act Sheet Pompe Disease: Decreased Acid Alpha-Glucosidase

Special Instructions

- Informed Consent for Genetic Testing
- Biochemical Genetics Patient Information
- Newborn Screening Act Sheet Pompe Disease: Decreased Acid Alpha-Glucosidase
- Newborn Screen Follow-up for Pompe Disease
- Informed Consent for Genetic Testing (Spanish)

Method Name

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

NY State Available

Yes

Specimen

Specimen Type

Whole Blood ACD

Shipping Instructions

For optimal isolation of leukocytes, it is recommended the specimen arrive refrigerate within 96 hours of collection to be stabilized. Collect specimen Monday through Thursday only and not the day before a holiday. Specimen should be collected and packaged as close to shipping time as possible.

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 original tube. Do not transfer blood to other containers.

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 in Special Instructions:

-Informed Consent for Genetic Testing (T576)

-Informed Consent for Genetic Testing-Spanish (T826)

2. Biochemical Genetics Patient Information(T602) in Special Instructions

Specimen Minimum Volume

2 mL

Reject Due To

Gross hemolysis	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Whole Blood ACD	Refrigerated (preferred)	4 days	
	Ambient	72 hours	

Clinical and 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, andÂ 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 (such as 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 be helpful in distinguishing 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 initial diagnosis and for treatment monitoring.

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

Reference Values

> or =1.50 nmol/hour/mg protein

An interpretive report is provided.

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 (GAA) activity, but it is not consistent with Pompe disease. Molecular analysis (GAAZ / Pompe Disease, Full Gene Analysis, Varies) should be performed to resolve the clinical question.

Additional biochemical or molecular testing is recommended to confirm a diagnosis if an 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 Aug;118(4):304-309

2. Matern D, Gavrilov D, Oglesbee D, et al: Newborn screening for lysosomal storage disorders. Semin Perinatol. 2015 Apr;39(3):206-216

3. Valle D, Beaudet AL, Vogelstein B, Kinzler KW, et al, eds. Lysosomal disorders. In: The Online Metabolic and Molecular Bases of Inherited Disease (OMMBID). Part 16. McGraw-Hill; 2014. Accessed 2/11/2019.Â Available at http://ommbid.mhmedical.com/book.aspx?bookid=971

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 Apr;63(4):842-851

5. Leslie N, Bailey L: Pompe disease. In: Adam MP, Ardinger HH, Pagon RA, et al. GeneReviews. [Internet] University of Washington, Seattle; 2007. Updated May 2017. Accessed February 11, 2019. 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 (GAA) 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 (LC-MS/MS). GLA is

included to verify sample integrity.(Unpublished Mayo method)

PDF Report

No

Day(s) and Time(s) Test Performed

Specimens are processed Monday through Sunday.

Assay is performed: Varies

Analytic Time

5 days

Maximum Laboratory Time

10 days

Specimen Retention Time

WBC homogenate; 1 month

Performing Laboratory Location

Rochester

Fees and 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 Regional Manager. 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. This test has not been cleared or approved by the U.S. Food and Drug Administration.

CPT Code Information

82657

LOINC® Information

Test ID	Test Order Name	Order LOINC Value
GAAW	Acid Alpha-Glucosidase, Leukocytes	24051-5

Result ID	Test Result Name	Result LOINC Value
606267	Acid Alpha-Glucosidase, Leukocytes	24051-5
606268	Interpretation	59462-2
606269	Reviewed By	18771-6