Overview

Useful For
Diagnosis of UDP-galactose 4' epimerase deficiency

Genetics Test Information
Enzymatic testing for the diagnosis of uridine diphosphate (UDP)-galactose 4' epimerase (GALE) deficiency.

Testing Algorithm
See Galactosemia Testing Algorithm in Special Instructions for additional information.

Special Instructions
- Informed Consent for Genetic Testing
- Galactosemia Testing Algorithm
- Biochemical Genetics Patient Information
- Informed Consent for Genetic Testing (Spanish)
- Galactosemia-Related Test List

Method Name
Enzyme Reaction followed by Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS)

NY State Available
Yes

Specimen

Specimen Type
Whole Blood EDTA

Advisory Information
This test is appropriate for diagnosis of uridine diphosphate-galactose 4’ epimerase (GALE) deficiency but will not detect galactokinase (GALK) deficiency or galactose-1-phosphate uridyltransferase (GALT) deficiency.

- To evaluate for GALK deficiency, order GALK / Galactokinase, Blood.
- To evaluate for GALT deficiency, order GALT / Galactose-1-Phosphate Uridyltransferase, Blood.

This assay is not appropriate for monitoring dietary compliance. If dietary monitoring is needed, order GAL1P / Galactose-1-Phosphate (Gal-1-P), Erythrocytes.

Necessary Information
Patient's age is required.

Biochemical Genetics Patient Information (T602) is recommended, but not required, to be filled out and sent with the specimen to aid in the interpretation of test results.

Specimen Required
Multiple whole blood tests for galactosemia can be performed on 1 specimen. Prioritize order of testing when
submitting specimens. See [Galactosemia-Related Test List](#) in Special Instructions for a list of tests that can be ordered together.

**Container/Tube:**

**Preferred:** Lavender top (EDTA)

**Acceptable:** Green top (sodium or lithium heparin) or yellow top (ACD)

**Specimen Volume:** 5 mL

**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) is recommended, see Special Instructions.

3. If not ordering electronically, complete, print, and send an [Inborn Errors of Metabolism Test Request](#) (T798) with the specimen.

**Specimen Minimum Volume**

2 mL

**Reject Due To**

<table>
<thead>
<tr>
<th>Gross hemolysis</th>
<th>Reject</th>
</tr>
</thead>
</table>

**Specimen Stability Information**

<table>
<thead>
<tr>
<th>Specimen Type</th>
<th>Temperature</th>
<th>Time</th>
<th>Special Container</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole Blood EDTA</td>
<td>Refrigerated (preferred)</td>
<td>14 days</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ambient</td>
<td>6 days</td>
<td></td>
</tr>
</tbody>
</table>

**Clinical and Interpretive**

**Clinical Information**

Galactosemia is an autosomal recessive disorder that results from a deficiency of any 1 of the 3 enzymes catalyzing the conversion of galactose to glucose: galactose-1-phosphate uridylyltransferase (GALT), galactokinase (GALK), and uridine diphosphate galactose-4-epimerase (GALE). Epimerase deficiency galactosemia can be categorized into 3 types: generalized, peripheral, and intermediate. Generalized epimerase deficiency galactosemia results in profoundly decreased enzyme activity in all tissues, whereas peripheral epimerase deficiency galactosemia results in decreased enzyme activity in red and white blood cells, but normal enzyme activity in all other tissues. This is compared to intermediate epimerase deficiency galactosemia which results in decreased enzyme activity in red and
white blood cells and less than 50% of normal enzyme levels in other tissues.

Clinically, infants with generalized epimerase deficiency galactosemia develop symptoms such as liver and renal dysfunction and mild cataracts when on a normal milk diet, while infants with peripheral or intermediate epimerase deficiency galactosemia do not develop any symptoms. Generalized epimerase deficiency galactosemia is treated by a galactose- and lactose-restricted diet, which can improve or prevent the symptoms of renal and liver dysfunction and mild cataracts. Despite adequate treatment from an early age, individuals with generalized epimerase deficiency galactosemia remain at increased risk for developmental delay and intellectual disability. Unlike patients with classic galactosemia resulting from a GALT deficiency, females with generalized epimerase deficiency galactosemia experience normal puberty and are not at increased risk for premature ovarian failure. Based upon reports by newborn screening programs, the frequency of epimerase deficiency galactosemia in the United States ranges from approximately 1 in 6700 in African American infants to 1 in 70,000 infants of European ancestry.

Galactose-1-phosphate (Gal-1-P) accumulates in the erythrocytes of patients with galactosemia due to either GALT or GALE deficiency. The quantitative measurement of Gal-1-P (GAL1P / Galactose-1-Phosphate [Gal-1-P], Erythrocytes) is useful for monitoring compliance with dietary therapy. Gal-1-P is thought to be the causative factor for development of liver disease in these patients and, because of this, patients should maintain low levels and be monitored on a regular basis.

Newborn screening varies from state to state and identifies potentially affected individuals by measuring total galactose (galactose and Gal-1-P) and/or determining the activity of the GALT enzyme. The diagnosis of galactosemia is established by follow-up quantitative measurement of GALT enzyme activity. If enzyme levels are normal, but an infant has an elevated Gal-1-P, then epimerase deficiency galactosemia is to be considered. Molecular testing via sequencing of the GALE gene may be performed.

See Galactosemia Testing Algorithm in Special Instructions.

Reference Values
> or =3.5 nmol/h/mg of hemoglobin

Interpretation
An interpretive report will be provided.

Cautions
The results of testing performed in erythrocytes, including analysis of enzymes, biochemical phenotyping, or galactose-1-phosphate are invalid following a transfusion.

Clinical Reference


Performance

Method Description
A buffered enzyme incubation with substrate and cofactors is performed on lysed red blood cells. A postincubation
Test Definition: GALE
UDP-galactose 4’ epimerase, RBC

extraction is performed and subjected to liquid chromatography-tandem mass spectrometry (LC-MS/MS). The ratio of the extracted product to its internal standard is used to calculate the total enzymatic product. This is then normalized using the calculated hemoglobin concentration to determine the patient's enzyme level in nmol/h/mg of hemoglobin. (Unpublished Mayo method)

PDF Report
No

Day(s) and Time(s) Test Performed
Friday, 7 a.m. (specimen must be received the day prior)

Analytic Time
8 days (not reported on Saturday or Sunday)

Maximum Laboratory Time
15 days

Specimen Retention Time
2 months

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
82542

LOINC® Information

<table>
<thead>
<tr>
<th>Test ID</th>
<th>Test Order Name</th>
<th>Order LOINC Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>GALE</td>
<td>UDP-galactose 4’ epimerase, RBC</td>
<td>79469-3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Result ID</th>
<th>Test Result Name</th>
<th>Result LOINC Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>64372</td>
<td>UDP-galactose 4’ epimerase, RBC</td>
<td>79469-3</td>
</tr>
<tr>
<td>37979</td>
<td>Interpretation (GALE)</td>
<td>59462-2</td>
</tr>
<tr>
<td>37978</td>
<td>Reviewed By</td>
<td>18771-6</td>
</tr>
</tbody>
</table>