Glutaric Aciduria Type I (GA-I): \textit{GCDH} Gene Deletion/Duplication

\textbf{Test Code:} NL  
\textbf{Turnaround time:} 2 weeks  
\textbf{CPT Codes:} 81228 x1

\section*{Condition Description}

Glutaric aciduria type I (GA-I) is an autosomal recessive inborn error of lysine, hydroxylysine, and tryptophan metabolism caused by deficiency of the enzyme glutaryl-CoA dehydrogenase [1]. Frequent laboratory findings include hypoglycemia, ketonuria, and metabolic acidosis. Urinary 3-hydroxyglutaric acid is the diagnostic metabolite with glutaric acid and glutarylcarcinine frequently but not always elevated [2]. The buildup of metabolites may lead to basal ganglia injury.

The clinical manifestations of GA-1 can vary considerably between individual patients, but most have macrocephaly at birth or shortly thereafter. Affected individuals may experience motor difficulty, abnormal gait, spasms, jerking, rigidity, hypotonia, and seizures. Some individuals with glutaric acidemia have developed subdural or retinal hemorrhage. MRI or CT of the brain may show an underdeveloped neocortex with fronto-operculo-temporal hypoplasia and communicating hydrocephalus, creating a distinct radiologic appearance that characterizes GA-I. The presentation of distinctive acute striatal necrosis is a major cause of morbidity and mortality. Acute neurological deterioration usually occurs between 6 and 18 months of age and can be triggered by a febrile illness or dehydration.

GA-1 is caused by mutations in the glutaryl-CoA dehydrogenase gene (\textit{GCDH}) located on 19p13 [3]. Gene sequence analysis is available to test for mutations in the \textit{GCDH} gene (FX).

\begin{itemize}
  \item Tortorelli \textit{et al.} The urinary excretion of glutarylcarcinine is an informative tool in the biochemical diagnosis of glutaric acidemia type I. \textit{Mol Genet Metab} 84 (2005) 137-143.
\end{itemize}

\section*{Genes}

\texttt{GCDH}

\section*{Indications}

This test is indicated for:

\begin{itemize}
  \item Confirmation of a clinical/biochemical diagnosis of GA-I
  \item Carrier testing in adults with a family history of GA-I
\end{itemize}

\section*{Methodology}

DNA isolated from peripheral blood is hybridized to a CGH array to detect deletions and duplications. The targeted CGH array has overlapping probes which cover the entire genomic region. Please note that a "backbone" of probes across the entire genome are included on the array for analytical and quality control purposes. Rarely, off-target copy number variants causative of disease may be identified that may or may not be related to the patient's phenotype. Only known pathogenic off-target copy number variants will be reported. Off-target copy number variants of unknown clinical significance will not be reported.

\section*{Detection}

Detection is limited to duplications and deletions. Array CGH will not detect point mutations or intronic mutations. Results of molecular analysis must be interpreted in the context of the patient's clinical and/or biochemical phenotype.

\textbf{Prevalence:} The incidence of GA-I is estimated to be 1:83,300 [6]. It is inherited in an autosomal recessive manner, therefore the recurrence risk for carrier parents of an affected child is 25%.

\section*{Specimen Requirements}

Submit only 1 of the following specimen types

* Preferred specimen type: Whole Blood

\textbf{Type:} Whole Blood
Specimen Requirements:

In EDTA (purple top) tube:
Infants (2 years): 3-5 ml
Older Children & Adults: 5-10 ml

Specimen Collection and Shipping: Refrigerate until time of shipment. Ship sample within 5 days of collection at room temperature with overnight delivery.

**Type: Saliva**

Specimen Requirements:

Oragene™ Saliva Collection kit (available through EGL) used according to manufacturer instructions.

Specimen Collection and Shipping: Store sample at room temperature. Ship sample within 5 days of collection at room temperature with overnight delivery.

**Special Instructions**

Submit copies of diagnostic biochemical test results with the sample. Sequence analysis is required before deletion/duplication analysis by targeted CGH array. If sequencing is performed outside EGL Genetics, please submit a copy of the sequencing report with the test requisition. Contact the laboratory if further information is needed.

**Related Tests**

- Urine Organic Acid Analysis (OA) showing elevation of glutaric and 3-hydroxyglutaric acids
- Plasma/Urine Acylcarnitine Profile showing increased concentration of glutarylcarnitine.
- Custom Diagnostic Mutation Analysis (KM) is available to family members if mutations are identified by sequencing.
- Prenatal testing is available to couples who are confirmed carriers of mutations. Please contact the laboratory genetic counselor to discuss appropriate testing prior to collecting a prenatal specimen.