Hyperinsulinemic Hypoglycemia: \textit{HADH} Gene Deletion/Duplication

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

\textbf{Condition Description}

Congenital hyperinsulinemic hypoglycemia (HH) is a major cause of hypoglycemic brain injury and mental retardation and is caused by unregulated insulin secretion by pancreatic beta-cells. Neonatal-onset disease manifests within hours to 1-2 days after birth. Childhood-onset disease manifests during the first months or years of life. In the newborn period, presenting symptoms may be nonspecific, including seizures, hypotonia, poor feeding, and apnea. In severe cases, serum glucose concentrations are typically extremely low and thus easily recognized, whereas in milder cases, variable and mild hypoglycemia may make the diagnosis more difficult. Even within the same family, disease manifestations can range from mild to severe. Both sporadic and familial forms of congenital HH are known; the sporadic form has an incidence of 1 in 40-50,000 live births while the familial form has an incidence of 1 in 2500 in communities with high rates of consanguinity.

Mutations in seven genes involved in regulation of insulin secretion are responsible for about 50-60\% of known cases of congenital HH. Loss-of-function mutations in the \textit{HADH} gene (4q22-q26) can lead to relatively mild late onset intermittent HH or to severe neonatal hypoglycemia. Elevated urine 3-hydroxyglutaric acid and serum 3-hydroxybutyryl-carnitine have been shown to be diagnostically useful markers for HH due to HADH deficiency. HH caused by mutations in the \textit{HADH} gene is inherited in an autosomal recessive manner.

The enzyme encoded by the \textit{HADH} gene had been previously referred to as 'SCHAD.' Accordingly, some cases of human metabolic disorders previously reported as 'SCHAD deficiency' are in fact cases of 'HADH deficiency.'

This test includes only \textit{HADH} gene sequencing, and does not include analysis of other genes associated with hyperinsulinemic hypoglycemia.

For patients with suspected HH, sequence analysis is recommended as the first step in mutation identification. For patients in whom mutations are not identified by full gene sequencing, deletion/duplication analysis is appropriate.

\textbf{References:}


\textbf{Genes}

\textbf{HADH}

\textbf{Indications}

This test is indicated for:

- Confirmation of a clinical diagnosis of HH in individuals with elevated urine 3-hydroxyglutaric acid and serum 3-hydroxybutyryl-carnitine who have tested negative for sequence analysis
- Carrier testing in adults who have a family history of HH with elevated urine 3-hydroxyglutaric acid and serum 3-hydroxybutyryl-carnitine and who have tested negative for sequence analysis

\textbf{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.

\textbf{Detection}

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

\textbf{Specimen Requirements}

\textit{Submit only 1 of the following specimen types}

\textbf{Type: Whole Blood (EDTA)}

\textbf{Specimen Requirements:}

EDTA (Purple Top)  
Infants and Young Children (2 years of age to 10 years old): 3-5 ml

Disclaimer: This information is confidential and subject to change without notice. It may not be reproduced in whole or part unless authorized in writing by an authorized EGL representative.
Older Children & Adults: 5-10 ml
Autopsy: 2-3 ml unclotted cord or cardiac blood

**Specimen Collection and Shipping:**
Ship sample at room temperature for receipt at EGL within 72 hours of collection. Do not freeze.

**Type:** DNA, Isolated

**Specimen Requirements:**
Microtainer
3µg
Isolation using the Perkin Elmer™Chemagen™ Automated Extraction method or Qiagen™ Puregene kit for DNA extraction is recommended.

**Specimen Collection and Shipping:**
Refrigerate until time of shipment in 100 ng/µL in TE buffer. Ship sample at room temperature with overnight delivery.

**Special Instructions**
Submit copies of diagnostic biochemical test results with the sample, if appropriate. Contact the laboratory if further information is needed.

Sequence analysis is required before deletion/duplication analysis by targeted CGH array. If sequencing is performed outside of EGL Genetics, please submit a copy of the sequencing report with the test requisition.

**Related Tests**

- Sequence analysis of the *HADH* gene is available and is required before deletion/duplication analysis.
- 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.