**HSD17B10-related Disorders: HSD17B10 Gene Sequencing**

**Test Code:** SHSD1  
**Turnaround time:** 6 weeks  
**CPT Codes:** 81479 x1

### Condition Description

Intellectual disability (ID) is a nonprogressive cognitive impairment affecting 1-3% of the Western population. It is estimated that up to 50% of moderate-severe cases have genetic causes and approximately 10% are due to X-linked intellectual disability disorders (XLID). XLID can be syndromic or nonsyndromic and is observed in all ethnic groups. More than 100 XLID syndromes have been described in the literature to date. Fragile X is the most common XLID syndrome (~1 in 4000 males) while others can be quite rare with only a few patients reported in the literature. Males can have moderate to severe intellectual disability depending on the syndrome, and carrier females can also be affected, but typically have milder clinical symptoms.

Mutations in the *HSD17B* gene (Xp11.22) also referred to as *HAD2* can cause syndromic X-linked mental retardation 10, X-linked mental retardation 17, or 2-methyl-3-hydroxybutyryl-CoA dehydrogenase deficiency.

#### Syndromic X-Linked Mental Retardation 10

Reyniers et al. described five patients from a four generation family who had mild intellectual disability and neurological symptoms. The neurological features included abnormal behavior and choreoathetosis. Choreoathetosis is the most distinguishing feature in individuals with this syndrome. It is characterized by chorea, which is involuntary, irregular, purposeless, nonrhythmic, abrupt, rapid movements, blended with athetosis, which is slow, writhing, continuous movements. Behavioral abnormalities included aggression, agitation, hallucination, and self mutilation. Carrier females were unaffected. Lenski et al. identified a mutation in *HSD17B10* in affected family members that results in decreased protein expression.

#### X-Linked Mental Retardation 17

Microduplications of chromosome Xp11.22, including both the *HSD17B10* and the *HUWE1* genes, cause a nonsyndromic form of X-linked intellectual disability (X-Linked Mental Retardation 17). The intellectual disability is mild to moderate in severity.

#### 2-Methyl-3-Hydroxybutyryl-CoA Dehydrogenase Deficiency

2-Methyl-3-hydroxybutyryl-CoA dehydrogenase (MHBD) deficiency, also called 17-beta-hydroxysteroid dehydrogenase X deficiency, is an X-linked inborn error of isoleucine metabolism. MHBD deficiency is characterized by progressive loss of mental and motor skills following normal early development. The most common clinical feature is speech delay. Other common symptoms include visual and hearing alterations, hypotonia, epilepsy, and cerebral atrophy. The onset of regression is variable. Typically males are affected with MHBD deficiency, however, carrier females can present with a milder phenotype. Females can have mild to moderate developmental delay but do not show regression. Garcia-Willoria et al. found *HSD17B10* mutations in affected individuals in two families.

For patients with suspected *HSD17B10*-related disorder, 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.

### References:

- OMIM #300256: *HSD17B10* gene  
- OMIM #300220: XLMR 10  
- OMIM #300705: XLMR 17  
- OMIM #300438: MHBD

### Genes

**HSD17B10**

### Indications

This test is indicated for:

- Confirmation of a clinical diagnosis of a *HSD17B10*-Related Disorder.  
- Carrier testing in adults with a family history of a *HSD17B10*-Related Disorder.

### Methodology

PCR amplification of 6 exons contained in the *HSD17B10* gene is performed on the patient's genomic DNA. Direct sequencing of amplification products is performed in both forward and reverse directions, using automated fluorescence dideoxy sequencing methods. The patient's gene sequences are then compared to a normal reference sequence. Sequence variations are classified as mutations, benign variants unrelated to disease, or variations of unknown clinical significance. Variants of unknown clinical significance may require further studies of the patient and/or family members. This assay does not interrogate the promoter region, deep intronic regions, or other regulatory elements, and does not detect large deletions.
Detection

Clinical Sensitivity: Unknown. Mutations in the promoter region, some mutations in the introns and other regulatory element mutations cannot be detected by this analysis. Large deletions will not be detected by this analysis. Results of molecular analysis should be interpreted in the context of the patient's clinical and/or biochemical phenotype.

Analytical Sensitivity: ~99%

Specimen Requirements

Submit only 1 of the following specimen types

Type: Saliva

Specimen Requirements:
Oragene™ Saliva Collection Kit
Orangene™ Saliva Collection Kit used according to manufacturer instructions. Please contact EGL for a Saliva Collection Kit for patients that cannot provide a blood sample.

Specimen Collection and Shipping:
Please do not refrigerate or freeze saliva sample. Please store and ship at room temperature.

Type: Whole Blood (EDTA)

Specimen Requirements:
EDTA (Purple Top)
Infants and Young Children (2 years of age to 10 years old): 3-5 ml
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
8µg
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.

Related Tests

- Deletion/duplication analysis of the HSD17B10 gene by CGH array is available for those individuals in whom sequence analysis is negative.
- Custom diagnostic mutation analysis (KM) is available to family members if mutations are identified by targeted mutation testing or sequencing analysis.
- Prenatal testing is available only for known familial mutations to individuals who are confirmed carriers of mutations. Please contact the laboratory genetic counselor to discuss appropriate testing prior to collecting a prenatal specimen.
- X-Linked Intellectual Disability panels are available for 30, 60, and 90 genes.