**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 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 HADH2 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**

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.
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

* Preferred specimen type: Whole Blood

**Type: Whole Blood**

Specimen Requirements:

In EDTA (purple top) or ACD (yellow 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.

**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.