GM2-Gangliosidosis AB Variant: GM2A Gene Sequencing

Test Code: SGM2A
Turnaround time: 4 weeks
CPT Codes: 81479 x1

Condition Description

The GM2 gangliosidoses (Tay Sachs, Sandhoff, and GM2 gangliosidosis AB variant) are a clinically indistinguishable group of neurodegenerative diseases caused by accumulation of a fatty substance, glycosphingolipid GM2 ganglioside, in the lysosomes. The GM2 gangliosides are normally broken down, in the lysosomes, by the enzyme \( \beta \)-hexosaminidase A, which is made up of an alpha and a beta subunit, with the help of a cofactor, the GM2 activator protein. The alpha and beta subunits are coded by the genes, HEXA, and HEXB, respectively and the GM2 activator protein is coded by the GM2A gene.

Mutations in the HEXA and HEXB genes cause Tay Sachs disease and Sandhoff disease, respectively. These two diseases are distinguished biochemically by enzymatic analysis of \( \beta \)-hexosaminidase A (a heterodimer of the alpha and beta subunits), that is deficient in Tay Sachs and \( \beta \)-hexosaminidase B (a homodimer of two beta subunits), that is deficient in Sandhoff’s disease. \( \beta \)-hexosaminidase A and \( \beta \)-hexosaminidase B enzyme activities are normal in GM2 gangliosidosis AB variant.

Mutations in the GM2A gene (5q33.1) cause the rare GM2 gangliosidosis AB variant (GM2 AB variant) due to the deficiency of the GM2 activator protein and are inherited in an autosomal recessive manner. The clinical course of GM2 AB variant is similar to that of a patient with classic Tay Sachs disease. Disease onset usually occurs after five or six months of age and follows a neurodegenerative course with features including delayed motor milestones, hypotonia, macular cherry red spots, and abnormal MRI findings.

Sequence analysis of the entire GM2A gene coding region is available for individuals suspected of having GM2 AB variant and their at-risk relatives on a clinical basis.

References:

- Chen et al. (1999), Am J Hum Genet, 65:77-87.
- OMIM #272750: GM2-gangliosidosis AB variant
- OMIM #613109: GM2A gene

Genes

GM2A

Indications

This test is indicated for:
- Confirmation of a clinical diagnosis of GM2-gangliosidosis AB variant.
- Carrier testing in adults with a family history of GM2-gangliosidosis AB variant.

Methodology

PCR amplification of 4 exons contained in the GM2A 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

* Preferred specimen type: Whole Blood

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, if appropriate. Contact the laboratory if further information is needed.

**Related Tests**

- 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.
- For confirmation purposes, if two mutations or variants of unknown clinical significance are identified, glycolipids in CSF can be performed on a research basis.