Mucopolysaccharidosis Type IVA: GALNS Gene Sequencing

**Test Code:** BU
**Turnaround time:** 4 weeks
**CPT Codes:** 81479 x1

### Condition Description

Mucopolysaccharidosis type IV A (Morquio syndrome, MPS IV A) is a member of a group of inherited metabolic disorders collectively termed mucopolysaccharidoses (MPSs). The MPSs are caused by a deficiency of lysosomal enzymes required for the degradation of mucopolysaccharides or glycosaminoglycans (GAGs). Morquio syndrome type IVA is caused by deficiency of galactosamine-6-sulfatase (N-acetyl-galactosamine-6-sulfate sulfatase deficiency). Deficiency of this enzyme leads to the accumulation of the GAG, keratan sulfate, in the lysosomes.

Symptoms of Morquio syndrome include the excretion of specific urinary glycosaminoglycans and skeletal abnormalities. Most individuals affected by Morquio syndrome do not have coarse facial features or mental retardation. Skeletal manifestations of Morquio syndrome include: odontoid hypoplasia, a striking short trunk dwarfism, and genu valgus. Compared to other patients with MPS, those with Morquio syndrome tend to have greater spine involvement with scoliosis, kyphosis, and severe gibbus, as well as platyspondyly, rib flaring, pectus carinatum, and ligamentous laxity. In earlier clinical descriptions, MPS Type IVA was considered to have more severe manifestations than type IVB. However, with the ability to differentiate between types A and B by enzyme analysis, it is understood that significant variability in clinical expression exists within both groups. No clear clinical differentiation between Morquio syndrome type IVA and IVB exists.

Mutations to the **GALNS** gene cause deficiency of galactosamine-6-sulfatase. Diagnostic sequencing analysis of the **GALNS** gene coding region is available for MPS IV A patients and their at-risk relatives on a clinical basis.

For patients with mutations not identified by full gene sequencing, a separate deletion/duplication assay is available using a targeted CGH array (LX).

For questions about testing for MPS IV A, call the Emory Genetics Laboratory at (404) 778-8499 or (855) 831-7447. For further clinical information about lysosomal storage diseases, including management and treatment, call the Emory Lysosomal Storage Disease Center at (404) 778-8565 or (800) 200-1524.

### References:

### Methodology

PCR amplification of 14 exons contained in the **GALNS** gene coding region will performed on patient genomic DNA. Direct sequencing of amplification products is performed in both the forward and reverse directions using automated fluorescence dideoxy sequencing methods. Patient gene sequences are compared to a normal reference sequence. Sequence variations are then 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. Large deletions are not detected by this analysis. Results of molecular analysis must interpreted in the context of the patients clinical and/or biochemical phenotype.

### Detection

**Full Gene Sequencing:**
- **Clinical Sensitivity:** Tomatsu S, et al. reported a summary of 148 mutations found in affected patients (84% of alleles interrogated) [3]
- **Analytical Sensitivity:** ~99%

**Prevalence:** The estimated prevalence of all lysosomal storage disorders is 2-5 per 100,000. The prevalence of MPS IV is not specifically known, but is likely to be rare and may vary by ethnicity. Results of molecular analysis must interpreted in the context of the patient's clinical and/or biochemical phenotype.

### 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.

**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 of Emory Genetics Laboratory, please submit a copy of the sequencing report with the test requisition. Contact the laboratory if further information is needed.

**Related Tests**

- Mucopolysaccharide screen (urine GAG) (GA)
- Known mutation analysis (Custom Diagnostics) is available to test family members.
- Deletion/duplication analysis for the GALNS gene is available separately for individuals where mutations are not identified by sequence analysis.
- Prenatal testing is available for known familial mutations only. Please call the Laboratory Genetic Counselor for specific requirements for prenatal testing before collecting a fetal sample.