Bethlem Myopathy/Ullrich Congenital Muscular Dystrophy: COL6A1 Gene Sequencing

Test Code: SC6A1
Turnaround time: 4 weeks
CPT Codes: 81407 x1

Condition Description

The congenital muscular dystrophies are a group of genetically and clinically heterogeneous hereditary myopathies characterized by congenital hypotonia and muscle weakness, contractures, and delayed motor development. Muscle biopsy usually reveals a nonspecific dystrophic pattern. The clinical course is broadly variable and can involve the brain and eyes. Initial testing often includes clinical evaluation, muscle imaging, electromyography, and muscle biopsy, followed by targeted genetic testing.

Ullrich Congenital Muscular Dystrophy

Ullrich congenital muscular dystrophy (UCMD) has a more severe phenotype, in general, than BM. Common symptoms include neonatal muscle weakness, proximal joint contractures, hyperlaxity of the distal joints, failure to thrive, lack of independent ambulation, and severe respiratory impairments by the end of the first decade of life. Other symptoms can include congenital hip dislocation, torticollis, prominent ears and heels, keloid formation, and brain development are usually unaffected. Respiratory failure can lead to life-threatening infections in the first or second decade of life. UCMD is autosomal recessive in about 40% of cases, and is now known to be dominant in the other 60% of cases.

Histopathological findings on muscle biopsy for both conditions are either nonspecific or show dystrophic changes and CK levels are either normal or mildly elevated. Immunofluorescent labeling of collagen VI in fibroblast cultures is a useful diagnostic tool, although double labeling is recommended to verify that the collagen VI protein that is present localizes correctly to the basement membrane. Expression of laminin alpha 2 (merosin) is normal.

For patients with suspected Bethlem myopathy or Ullrich CMD, 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

- Ped and Dev Pathology.
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Genes

COL6A1

Indications

This test is indicated for:

- Confirmation of a clinical diagnosis of Bethlem myopathy or Ullrich CMD.
- Carrier testing in adults with a family history of autosomal recessive Ullrich CMD.

Methodology
**Next Generation Sequencing:** In-solution hybridization of all coding exons is performed on the patient's genomic DNA. Although some deep intronic regions may also be analyzed, this assay is not meant to interrogate most promoter regions, deep intronic regions, or other regulatory elements, and does not detect single or multi-exon deletions or duplications. Direct sequencing of the captured regions is performed using next generation sequencing. The patient's gene sequences are then compared to a standard reference sequence. Potentially causative variants and areas of low coverage are Sanger-sequenced. Sequence variations are classified as pathogenic, likely pathogenic, benign, likely benign, or variants of unknown significance. Variants of unknown significance may require further studies of the patient and/or family members.

### Detection

Clinical Sensitivity: Mutations in the **COL6A1**, **COL6A2**, and **COL6A3** genes are identified approximately 66% of individuals clinically affected with Bethlem myopathy and approximately 79% of individuals clinically affected with Ullrich CMD. 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 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.

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 **COL6A2** and **COL6A3** genes is also available.
- Deletion/duplication analysis of the **COL6A1-3** genes by CGH array is available for those individuals in whom sequence analysis is negative.
- **Familial mutation testing** is available to family members if mutations are identified by targeted mutation testing or sequencing 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.