Bethlem Myopathy/Ullrich Congenital Muscular Dystrophy: Sequencing Panel

Test Code: MCO6P  
Turnaround time: 6 weeks  
CPT Codes: 81407 x3

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.

Bethlem Myopathy

Bethlem myopathy (BM) is an autosomal dominant myopathy with contractures. BM is clinically heterogeneous, although the hallmark of this condition is early contractures of the interphalangeal joints of the fingers, elbows, and ankle joints, together with flexion contractures of the elbow and of the ankles. Other symptoms can include proximal weakness, decreased fetal movements, congenital torticollis, bilateral clubfeet, and keloid formation. IQ and brain development are usually unaffected. Onset may be in the neonatal period, childhood, or adolescence, but most children exhibit weakness or contractures during the first two years of life. Occasionally, spontaneous improvement of muscle weakness and of congenital contractures is noticed in the first decade. The course is slowly progressive, and after the fifth decade more than half of the patients need aids for ambulation, especially outdoors.

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 follicular hyperkeratosis, scoliosis, and facial weakness. IQ and brain development are usually unaffected. Onset may be in the neonatal period, childhood, or adolescence, but most children exhibit weakness or contractures in the first two years of life. Occasionally, spontaneous improvement of muscle weakness and of congenital contractures is noticed in the first decade. 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.

References


Genes

COL6A1, COL6A2, COL6A3

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 mean 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

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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**

Next Generation Sequencing: Clinical Sensitivity: Mutations in the **COL6A1, COL6A2, and COL6A3** genes are identified in over 60% of affected individuals. Mutations in the promoter region, some mutations in the introns and other regulatory element mutations cannot be detected by this analysis. Large deletions/duplications will not be detected by this analysis. Results of molecular analysis should be interpreted in the context of the patient's clinical/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.

**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**

- Deletion/duplication analysis is available for **COL6A1, COL6A2, and COL6A3**
- 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.