



## COL6A1 gene

collagen type VI alpha 1 chain

### Normal Function

The *COL6A1* gene provides instructions for making one component of type VI collagen, which is a flexible protein found in the space that surrounds cells. Specifically, the protein produced from the *COL6A1* gene is the alpha( $\alpha$ )1(VI) chain of type VI collagen. This chain combines with chains produced from other genes to produce a complete type VI collagen molecule.

Collagens are found in the extracellular matrix, which is an intricate lattice that forms in the space between cells and provides structural support. Type VI collagen is located in the extracellular matrix surrounding cells that make up the muscles used for movement (skeletal muscle cells) and cells that make up connective tissue, which provides strength and flexibility to structures throughout the body, including skin and joints. The extracellular matrix is necessary for cell stability and growth. Research suggests that type VI collagen links basement membranes, which are thin, sheet-like structures that are part of the extracellular matrix, to nearby cells.

### Health Conditions Related to Genetic Changes

#### Collagen VI-related myopathy

Mutations in the *COL6A1* gene have been found to cause some cases of collagen VI-related myopathy, which is a group of disorders that vary in severity but generally result in muscle weakness and joint deformities called contractures. These mutations often change single protein building blocks (amino acids) in the  $\alpha$ 1(VI) chain. The most frequently affected amino acid is glycine; changes to this building block disrupt the structure of the  $\alpha$ 1(VI) chain. Other mutations can also disrupt the structure of the  $\alpha$ 1(VI) chain.

Mutations in the *COL6A1* gene affect type VI collagen in different ways. Some mutations lead to altered  $\alpha$ 1(VI) chains that can be incorporated into the mature type VI collagen molecule, although they disrupt the molecule's structure and function. Other mutations result in an altered chain that cannot be incorporated at all. Still other mutations prevent the production of any functional  $\alpha$ 1(VI) chain, which impedes formation of type VI collagen. All of these *COL6A1* gene mutations lead to a reduction or absence of functional collagen VI molecules. While it is difficult to predict the severity of collagen VI-related myopathy based on the type of mutation, in

general, lower amounts of type VI collagen lead to more severe signs and symptoms that begin earlier in life.

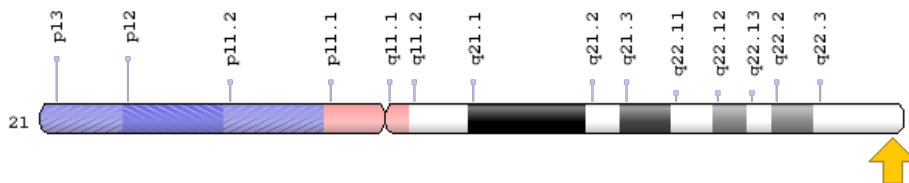
Changes in  $\alpha 1(\text{VI})$  chain structure or production lead to an unstable extracellular matrix that is no longer attached to cells through the basement membrane. As a result, the stability of muscle cells and connective tissue progressively declines, which leads to the muscle weakness, contractures, and other signs and symptoms of collagen VI-related myopathy.

### Limb-girdle muscular dystrophy

## Chromosomal Location

Cytogenetic Location: 21q22.3, which is the long (q) arm of chromosome 21 at position 22.3

Molecular Location: base pairs 45,981,770 to 46,005,048 on chromosome 21 (Homo sapiens Updated Annotation Release 109.20190905, GRCh38.p13) (NCBI)



Credit: Genome Decoration Page/NCBI

## Other Names for This Gene

- alpha 1 (VI) chain (61 AA)
- CO6A1\_HUMAN
- collagen alpha-1(VI) chain
- collagen type VI alpha 1
- collagen VI, alpha-1 polypeptide
- collagen, type VI, alpha 1

## **Additional Information & Resources**

### Educational Resources

- Molecular Cell Biology (fourth edition, 2000): Collagens Form Diverse Structures  
<https://www.ncbi.nlm.nih.gov/books/NBK21582/#A6554>
- The Cell: A Molecular Approach (second edition, 2000): The Extracellular Matrix  
<https://www.ncbi.nlm.nih.gov/books/NBK9874/#A2045>
- Washington University, St. Louis: Neuromuscular Disease Center  
<https://neuromuscular.wustl.edu/musdist/lg.html#col6prot>

### Clinical Information from GeneReviews

- Collagen Type VI-Related Disorders  
<https://www.ncbi.nlm.nih.gov/books/NBK1503>

### Scientific Articles on PubMed

- PubMed  
<https://www.ncbi.nlm.nih.gov/pubmed?term=%28COL6A1%5BTIAB%5D%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1800+days%22%5Bdp%5D>

### Catalog of Genes and Diseases from OMIM

- COLLAGEN, TYPE VI, ALPHA-1  
<http://omim.org/entry/120220>

### Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology  
[http://atlasgeneticsoncology.org/Genes/GC\\_COL6A1.html](http://atlasgeneticsoncology.org/Genes/GC_COL6A1.html)
- ClinVar  
<https://www.ncbi.nlm.nih.gov/clinvar?term=COL6A1%5Bgene%5D>
- HGNC Gene Symbol Report  
[https://www.genenames.org/data/gene-symbol-report/#!/hgnc\\_id/HGNC:2211](https://www.genenames.org/data/gene-symbol-report/#!/hgnc_id/HGNC:2211)
- Monarch Initiative  
<https://monarchinitiative.org/gene/NCBIGene:1291>
- NCBI Gene  
<https://www.ncbi.nlm.nih.gov/gene/1291>
- UniProt  
<https://www.uniprot.org/uniprot/P12109>

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