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(α)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 α1(VI) chain. The most frequently affected amino acid is glycine; changes to this building block disrupt the structure of the α1(VI) chain. Other mutations can also disrupt the structure of the α1(VI) chain.

Mutations in the COL6A1 gene affect type VI collagen in different ways. Some mutations lead to altered α1(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 α1(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 $\alpha_1$(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 109.20200522, 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

  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+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

- ClinVar

- HGNC Gene Symbol Report

- Monarch Initiative
  https://monarchinitiative.org/gene/NCBIGene:1291

- NCBI Gene

- UniProt
  https://www.uniprot.org/uniprot/P12109
Sources for This Summary

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/21943391
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3189202/

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/17886299

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