PLOD1 gene

procollagen-lysine,2-oxoglutarate 5-dioxygenase 1

Normal Function

The *PLOD1* gene provides instructions for making an enzyme called lysyl hydroxylase 1. This enzyme modifies an amino acid called lysine, which is one of the building blocks used to make proteins. Specifically, lysyl hydroxylase 1 converts lysine to a similar molecule, hydroxylysine, through a chemical reaction called hydroxylation. Hydroxylysine is commonly found in collagens, which are complex molecules that provide strength and support to many body tissues.

Hydroxylysine is essential for collagen molecules to form stable interactions, called cross-links, with one another in the spaces between cells. The cross-links result in the formation of very strong collagen fibers.

Health Conditions Related to Genetic Changes

Ehlers-Danlos syndrome

More than 30 mutations in the *PLOD1* gene have been found to cause a form of Ehlers-Danlos syndrome called the kyphoscoliotic type. Ehlers-Danlos syndrome is a group of disorders that affect the connective tissues that support the skin, bones, blood vessels, and many other organs and tissues. The kyphoscoliotic type is characterized by an unusually large range of joint movement (hypermobility), weak muscle tone (hypotonia), and severe, progressive curvature of the spine (kyphoscoliosis) that can interfere with breathing.

The most common *PLOD1* gene mutation abnormally copies (duplicates) a large portion of the gene, resulting in the production of a nonfunctional version of the lysyl hydroxylase 1 enzyme. Several other mutations introduce premature stop signals that prevent the production of any functional enzyme. A loss of lysyl hydroxylase 1 activity greatly reduces the amount of hydroxylysine, which impairs cross-linking between collagen molecules. This disruption in the network of collagen fibers weakens connective tissues, causing the signs and symptoms of the kyphoscoliotic type of Ehlers-Danlos syndrome.

Other Names for This Gene

- collagen lysyl hydroxylase
- LH
- LH1
- LLH
- lysine 2-oxoglutarate dioxygenase
- lysine hydroxylase
- lysyl hydroxylase
- PLOD
- PLOD1_HUMAN
- procollagen-L-lysine,2-oxoglutarate:oxygen oxidoreductase (5-hydroxylating)
- procollagen-lysine 1, 2-oxoglutarate 5-dioxygenase 1
- procollagen-lysine, 2-oxoglutarate 5-dioxygenase (lysine hydroxylase, Ehlers-Danlos syndrome type VI)
- procollagen-lysine, 2-oxoglutarate 5-dioxygenase 1
- protocollagen lysyl hydroxylase

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of PLOD1 (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=5351[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28%28PLOD1%5BTIAB%5D%29+OR+%28lysyl+hydroxylase+1%5BTIAB%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+3600+days%22%5Bdp%5D)

Catalog of Genes and Diseases from OMIM

- PROCOLLAGEN-LYSINE, 2-OXOGLUTARATE 5-DIOXYGENASE; PLOD1 (https://omim.org/entry/153454)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/5351)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=PLOD1[gene])

References

- Brady AF, Demirdas S, Fournel-Gigleux S, Ghali N, Giunta C, Kapferer-SeebacherI, Kosho T, Mendoza-Londono R, Pope MF, Rohrbach M, Van Damme T, Vandersteen A,van Mourik C, Voermans N, Zschocke J, Malfait F. The Ehlers-Danlos syndromes, rare types. Am J Med Genet C Semin Med Genet. 2017 Mar;175(1):70-115. doi:10.1002/ajmg.c.31550. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/28306225)
- Eyre D, Shao P, Weis MA, Steinmann B. The kyphoscoliotic type of Ehlers-Danlossyndrome (type VI): differential effects on the hydroxylation of lysine incollagens I and II revealed by analysis of cross-linked telopeptides from urine.Mol Genet Metab. 2002 Jul;76(3):211-6. doi: 10.1016/s1096-7192(02)00036-7. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/12126935)
- Giunta C, Burer-Chambaz C, Steinmann B. Novel human pathological mutations. Gene symbol: PLOD1. Disease: Ehlers-Danlos syndrome type VIA, kyphoscoliotictype. Hum Genet. 2009 Apr;125(3):346. No abstract available. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/19320026)
- Giunta C, Randolph A, Steinmann B. Mutation analysis of the PLOD1 gene: anefficient multistep approach to the molecular diagnosis of the kyphoscoliotictype of Ehlers-Danlos syndrome (EDS VIA). Mol Genet Metab. 2005Sep-Oct;86(1-2):269-76. doi: 10.1016/j.ymgme.2005.04.014. Epub 2005 Jun 24. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/15979919)
- Heikkinen J, Toppinen T, Yeowell H, Krieg T, Steinmann B, Kivirikko KI,Myllyla R. Duplication of seven exons in the lysyl hydroxylase gene is associatedwith longer forms of a repetitive sequence within the gene and is a common causefor the type VI variant of Ehlers-Danlos syndrome. Am J Hum Genet. 1997Jan;60(1):48-56. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/8981946) or Free article on PubMed Central (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1712545/)
- Malfait F, Francomano C, Byers P, Belmont J, Berglund B, Black J, Bloom L,Bowen JM, Brady AF, Burrows NP, Castori M, Cohen H, Colombi M, Demirdas S, DeBacker J, De Paepe A, Fournel-Gigleux S, Frank M, Ghali N, Giunta C, Grahame R,Hakim A, Jeunemaitre X, Johnson D, Juul-Kristensen B, Kapferer-Seebacher I,Kazkaz H, Kosho T, Lavallee ME, Levy H, Mendoza-Londono R, Pepin M, Pope FM,Reinstein E, Robert L, Rohrbach M, Sanders L, Sobey GJ, Van Damme T, VandersteenA, van Mourik C, Voermans N, Wheeldon N, Zschocke J, Tinkle B. The 2017international classification of the Ehlers-Danlos syndromes. Am J Med Genet CSemin Med Genet. 2017 Mar;175(1):8-26. doi: 10.1002/ajmg.c.31552. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/28306229)
- Rohrbach M, Vandersteen A, Yis U, Serdaroglu G, Ataman E, Chopra M, Garcia S, Jones K, Kariminejad A, Kraenzlin M, Marcelis C, Baumgartner M, Giunta C. Phenotypic variability of the kyphoscoliotic type of Ehlers-Danlos syndrome (EDSVIA) : clinical, molecular and biochemical delineation. Orphanet J Rare Dis. 2011Jun 23;6:46. doi: 10.1186/1750-1172-6-46. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/21699693) or Free article on PubMed Central (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3135503/)

Genomic Location

The *PLOD1* gene is found on chromosome 1 (https://medlineplus.gov/genetics/chromosome/1/).

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