ELN gene

elastin

Normal Function

The *ELN* gene provides instructions for making a protein called tropoelastin. Multiple copies of the tropoelastin protein attach to one another and are processed to form a mature protein called elastin. Elastin is the major component of elastic fibers, which are slender bundles of proteins that provide strength and flexibility to connective tissue (tissue that supports the body's joints and organs). Elastic fibers are found in the intricate lattice that forms in the spaces between cells (the extracellular matrix), where they give structural support to organs and tissues such as the heart, skin, lungs, ligaments, and blood vessels.

Health Conditions Related to Genetic Changes

Cutis laxa

At least 16 mutations in the *ELN* gene have been identified in people with a skin disorder called cutis laxa. *ELN* gene mutations cause a form of the disorder called autosomal dominant cutis laxa, which is characterized by loose, sagging skin; an increased risk of an abnormal bulging (an aneurysm) in a large blood vessel called the aorta; and a lung disease called emphysema, which can make it difficult to breathe.

The *ELN* mutations that cause autosomal dominant cutis laxa lead to the production of an abnormally long version of the tropoelastin protein. The abnormal protein likely interferes with the formation of mature elastin and the assembly of elastic fibers, which weakens connective tissue in the skin and blood vessels. This defect in connective tissue underlies the major features of cutis laxa.

Supravalvular aortic stenosis

More than 60 mutations in the *ELN* gene have been found to cause supravalvular aortic stenosis (SVAS), a heart defect present from birth that is characterized by a narrowing of the large blood vessel that carries blood from the heart to the rest of the body (the aorta). Most of the *ELN* gene mutations that cause SVAS lead to a decrease in the production of tropoelastin. A shortage of tropoelastin reduces the amount of mature elastin protein that is processed and available for forming elastic fibers. As a result, elastic fibers that make up the aorta are thinner than normal. To compensate, the smooth muscle cells that line the aorta increase in number, making the aorta thicker and narrower than usual. A thickened aorta is less flexible and resilient to the stress of constant blood flow and pumping of the heart. Over time, the wall of the aorta can become damaged. Aortic narrowing causes the heart to work

harder to pump blood through the aorta, which can lead to shortness of breath, chest pain, and ultimately heart failure.

7q11.23 duplication syndrome

The *ELN* gene is located in a region of chromosome 7 that is duplicated in people with 7q11.23 duplication syndrome. As a result of this duplication, people with 7q11.23 duplication syndrome have an extra copy of the *ELN* gene and several other genes in each cell. 7q11.23 duplication syndrome can cause a variety of neurological and behavioral problems as well as other abnormalities.

About half of individuals with 7q11.23 duplication syndrome have enlargement (dilatation) of the aorta; this enlargement can get worse over time. Aortic dilatation can lead to life-threatening complications if the wall of the aorta separates into layers (aortic dissection) or breaks open (ruptures). An extra copy of the *ELN* gene in each cell may lead to the production of a greater than normal amount of tropoelastin, and researchers suggest that this excess might be related to the increased risk for aortic dilatation in 7q11.23 duplication syndrome; however, the specific cause of the aortic dilatation remains unclear.

Williams syndrome

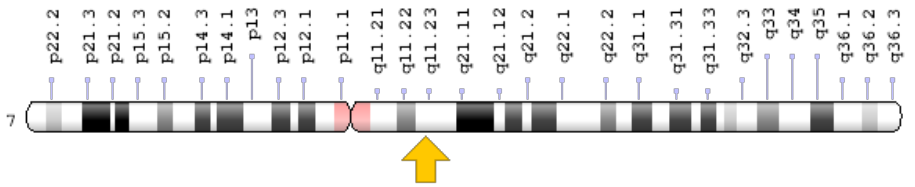
The *ELN* gene is located in a region of chromosome 7 that is deleted in people with Williams syndrome. As a result of this deletion, people with Williams syndrome are missing one copy of the *ELN* gene in each cell. This loss reduces the production of elastin by half, which disrupts the normal structure of elastic fibers in many connective tissues. Large blood vessels with abnormal elastic fibers are often thicker and less resilient than normal. These vessels can narrow, increasing the resistance to normal blood flow and leading to serious medical problems.

In people with Williams syndrome, a loss of the *ELN* gene is associated with connective tissue abnormalities, such a joint problems and loose skin, and cardiovascular disease, particularly SVAS.

Chromosomal Location

Cytogenetic Location: 7q11.23, which is the long (q) arm of chromosome 7 at position 11.23

Molecular Location: base pairs 74,027,772 to 74,069,907 on chromosome 7 (Homo sapiens Annotation Release 109, GRCh38.p12) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- elastin (supravalvular aortic stenosis, Williams-Beuren syndrome)
- ELN_HUMAN
- tropoelastin

Additional Information & Resources

Educational Resources

- Molecular Biology of the Cell (fourth edition, 2002): Elastin Gives Tissues Their Elasticity
  https://www.ncbi.nlm.nih.gov/books/NBK26810/#A3568

Clinical Information from GeneReviews

- 7q11.23 Duplication Syndrome
  https://www.ncbi.nlm.nih.gov/books/NBK327268
- Williams Syndrome
  https://www.ncbi.nlm.nih.gov/books/NBK1249

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28ELN%5BTIAB%5D%29+OR+%28elastin%5BTIAB%5D%29%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+720+days%22%5Bdp%5D

Catalog of Genes and Diseases from OMIM

- ELASTIN
  http://omim.org/entry/130160

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
  http://atlasgeneticsoncology.org/Genes/GC_ELN.html
- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=ELN%5Bgene%5D
- HGNC Gene Symbol Report
  https://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=3327
- Monarch Initiative
  https://monarchinitiative.org/gene/NCBIGene:2006
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