SERPINC1 gene

serpin family C member 1

Normal Function

The *SERPINC1* gene provides instructions for making a protein called antithrombin (previously known as antithrombin III), which is a type of serine protease inhibitor (serpin) . Serpins help control several types of chemical reactions by blocking the activity of certain proteins. Antithrombin is found in the bloodstream and is important for controlling blood clotting.

Antithrombin blocks the activity of proteins that promote blood clotting, especially a protein called thrombin. Antithrombin attaches (binds) to thrombin and certain other clotting proteins, which are then cleared from the bloodstream by the liver.

While one part of antithrombin binds to thrombin and other clotting proteins, another part of the protein binds to a substance called heparin. Antithrombin changes its shape when it binds to heparin. This change in shape allows antithrombin to inactivate clotting proteins at a much faster rate.

Health Conditions Related to Genetic Changes

Hereditary antithrombin deficiency

At least 220 mutations in the *SERPINC1* gene have been found to cause hereditary antithrombin deficiency. Most of these mutations change single protein building blocks (amino acids) in antithrombin, which disrupts its ability to control blood clotting.

Hereditary antithrombin deficiency can be divided into type I and type II based on the mutation in the *SERPINC1* gene.

Hereditary antithrombin deficiency type I is caused by *SERPINC1* gene mutations that prevent the cell from producing antithrombin from the altered gene. Individuals with this type have only one working copy of the *SERPINC1* gene in each cell, which results in approximately half of the normal amount of antithrombin. Affected individuals do not have enough antithrombin to inactivate clotting proteins, which causes the increased risk for abnormal blood clots in hereditary antithrombin deficiency.

Mutations that cause hereditary antithrombin deficiency type II result in the production of an altered antithrombin with reduced activity. Individuals with this form of the condition

typically have normal levels of antithrombin, but the protein does not function properly. Type II can be further divided based on whether the mutation affects binding to thrombin and other clotting factors (type IIa), heparin (type IIb), or both (type IIc). Individuals with hereditary antithrombin deficiency type IIb have a lower risk of forming an abnormal blood clot than people with other forms of this condition because antithrombin is able to inactivate clotting proteins without heparin.

Other Names for This Gene

- ANT3_HUMAN
- antithrombin (aa 375-432)
- antithrombin III
- AT3
- ATIII
- coding sequence signal peptide antithrombin part 1
- heparin cofactor I
- MGC22579
- serine (or cysteine) proteinase inhibitor, clade C (antithrombin), member 1
- serine-cysteine proteinase inhibitor clade C member 1
- serpin peptidase inhibitor, clade C (antithrombin), member 1
- serpin peptidase inhibitor, clade C, member 1
- signal peptide antithrombin part 1

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of SERPINC1 (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=462[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28SERPINC1%5BTIAB%5D%29+OR+%28%28antithrombin%5BTIAB%5D%29+OR+%28antithrombin+III%5BTIAB%5D%29+OR+%28AT3%5BTIAB%5D%29+OR+%28ATIII%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+360+days%22%5Bdp%5D)

Catalog of Genes and Diseases from OMIM

- SERPIN PEPTIDASE INHIBITOR, CLADE C (ANTITHROMBIN), MEMBER 1; SERPINC1 (https://omim.org/entry/107300)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/462)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=SERPINC1[gene])

References

- Brouwer JL, Lijfering WM, Ten Kate MK, Kluin-Nelemans HC, Veeger NJ, van derMeer J. High long-term absolute risk of recurrent venous thromboembolism inpatients with hereditary deficiencies of protein S, protein C or antithrombin.Thromb Haemost. 2009 Jan;101(1):93-9. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/19132194)
- Maclean PS, Tait RC. Hereditary and acquired antithrombin deficiency: epidemiology, pathogenesis and treatment options. Drugs. 2007;67(10):1429-40.doi: 10.2165/00003495-200767100-00005. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/17600391)
- Patnaik MM, Moll S. Inherited antithrombin deficiency: a review. Haemophilia.2008 Nov;14(6):1229-39. doi: 10.1111/j.1365-2516.2008.01830.x. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/19141163)
- Picard V, Nowak-Gottl U, Biron-Andreani C, Fouassier M, Frere C,Goualt-Heilman M, de Maistre E, Regina S, Rugeri L, Ternisien C, Trichet C,Vergnes C, Aiach M, Alhenc-Gelas M. Molecular bases of antithrombin deficiency:twenty-two novel mutations in the antithrombin gene. Hum Mutat. 2006Jun;27(6):600. doi: 10.1002/humu.9425. Erratum In: Hum Mutat. 2006Nov;27(11):1160. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/16705712)

Genomic Location

The *SERPINC1* gene is found on chromosome 1 (https://medlineplus.gov/genetics/chromosome/1/).

Last updated August 1, 2009