F12 gene

coagulation factor XII

Normal Function

The *F12* gene provides instructions for making a protein called coagulation factor XII. Coagulation factors are a group of related proteins that are essential for normal blood clotting (coagulation). After an injury, clots protect the body by sealing off damaged blood vessels and preventing further blood loss. Factor XII circulates in the bloodstream in an inactive form until it is activated, usually by coming in contact with damaged blood vessel walls. Upon activation, factor XII interacts with coagulation factor XI. This interaction sets off a chain of additional chemical reactions that form a blood clot.

Factor XII also plays a role in stimulating inflammation, a normal body response to infection, irritation, or other injury. When factor XII is activated, it also interacts with a protein called plasma prekallikrein. This interaction initiates a series of chemical reactions that lead to the release of a protein called bradykinin. Bradykinin promotes inflammation by increasing the permeability of blood vessel walls, allowing more fluids to leak into body tissues. This leakage causes the swelling that accompanies inflammation.

Health Conditions Related to Genetic Changes

Hereditary angioedema

At least two mutations in the *F12* gene are associated with hereditary angioedema type III. These mutations change single protein building blocks (amino acids) in factor XII, which increases the activity of the protein. As a result, more bradykinin is produced, which allows additional fluids to leak through blood vessel walls. The accumulation of fluids in body tissues leads to the episodes of swelling in people with hereditary angioedema type III.

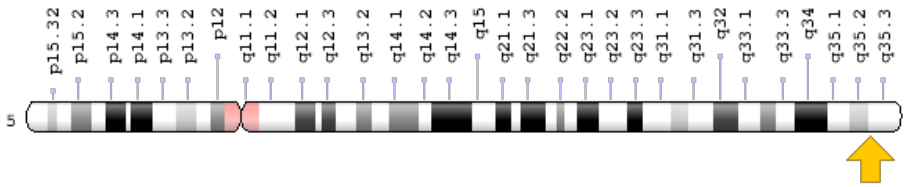
Other disorders

Approximately 20 mutations in the *F12* gene that cause factor XII deficiency have been identified. Factor XII deficiency is an inherited condition characterized by a shortage of factor XII in the blood. Individuals with this condition usually do not experience abnormal bleeding or other symptoms. Factor XII deficiency is typically discovered during routine blood testing because reduced levels of factor XII cause the blood to take longer to clot in a test tube. Most of the mutations that cause factor XII deficiency change single amino acids, which alters the structure of factor XII. It remains unclear why individuals with factor XII deficiency do not experience abnormal bleeding like those with deficiencies of other coagulation factors.

Chromosomal Location

Cytogenetic Location: 5q35.3, which is the long (q) arm of chromosome 5 at position 35.3

Molecular Location: base pairs 177,402,138 to 177,409,576 on chromosome 5 (Homo sapiens Updated Annotation Release 109.20190607, GRCh38.p13) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- coagulation factor XII (Hageman factor)
- FA12_HUMAN
- HAE3
- HAEX
- HAF
- Hageman factor

Additional Information & Resources

Educational Resources

- Biochemistry (fifth edition, 2002): Blood-Clotting Cascade https://www.ncbi.nlm.nih.gov/books/NBK22589/?rendertype=figure&id=A1401
- Canadian Hemophilia Society: Factor XII deficiency https://www.hemophilia.ca/factor-xii-deficiency/
- National Hemophilia Foundation: Factor XII deficiency https://www.hemophilia.org/Bleeding-Disorders/Types-of-Bleeding-Disorders/Other-Factor-Deficiencies/Factor-XII

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28factor+XII%5BTIAB%5D%29+OR+%28coagulation+factor+XII%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+1440+days%22%5Bdp%5D

Catalog of Genes and Diseases from OMIM

- COAGULATION FACTOR XII
  http://omim.org/entry/610619
- FACTOR XII DEFICIENCY
  http://omim.org/entry/234000

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
  http://atlasgeneticsoncology.org/Genes/GC_F12.html
- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=F12%5Bgene%5D
- HGNC Gene Symbol Report
  https://www.genenames.org/data/gene-symbol-report/#!/hgnc_id/HGNC:3530
- Monarch Initiative
  https://monarchinitiative.org/gene/NCBIGene:2161
- NCBI Gene
  https://www.ncbi.nlm.nih.gov/gene/2161
- UniProt
  https://www.uniprot.org/uniprot/P00748

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https://ghr.nlm.nih.gov/gene/F12

Reviewed: April 2009
Published: September 10, 2019

Lister Hill National Center for Biomedical Communications
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