FGG gene

fibrinogen gamma chain

Normal Function

The *FGG* gene provides instructions for making the fibrinogen gamma (γ) chain, one piece (subunit) of the fibrinogen protein. This protein is important for blood clot formation (coagulation), which is needed to stop excessive bleeding after injury. To form fibrinogen, the γ chain attaches to the fibrinogen A alpha (Aα) and fibrinogen B beta (Bβ) chains, each produced from different genes. Two sets of this three-protein complex combine to form functional fibrinogen.

For coagulation to occur, another protein called thrombin removes a piece from the Aα and the Bβ subunits of the functional fibrinogen protein (the pieces are called the A and B fibrinopeptides). This process converts fibrinogen to fibrin, the main protein in blood clots. Fibrin proteins attach to each other, forming a stable network that makes up the blood clot.

Health Conditions Related to Genetic Changes

Congenital afibrinogenemia

Mutations in the *FGG* gene can lead to congenital afibrinogenemia, a condition that causes excessive bleeding due to the absence of fibrinogen protein in the blood. Most *FGG* gene mutations that cause this condition lead to an abnormally short blueprint for protein formation (mRNA). If any fibrinogen γ chain is produced, it is nonfunctional. Because this condition occurs when both copies of the *FGG* gene are altered, there is a complete absence of functional fibrinogen γ chain. Without the γ subunit, the fibrinogen protein is not assembled, which results in the absence of fibrin. As a result, blood clots do not form in response to injury, leading to the excessive bleeding seen in people with congenital afibrinogenemia.

Other disorders

Mutations in one or both copies of the *FGG* gene can cause other bleeding disorders known as hypofibrinogenemia, dysfibrinogenemia, or hypodysfibrinogenemia.

Hypofibrinogenemia is a condition characterized by decreased levels of fibrinogen in the blood. This condition is caused by mutations that reduce but do not eliminate the

production of the fibrinogen γ chain. People with hypofibrinogenemia can have bleeding problems that vary from mild to severe. Generally, the less fibrinogen in the blood, the more severe the bleeding problems are.

Dysfibrinogenemia is a condition characterized by abnormally functioning fibrinogen, although the protein is present at normal levels. This condition is usually caused by mutations that change a single protein building block (amino acid) in the fibrinogen γ chain. These mutations alter the function of the fibrinogen protein and, depending on the functional change, can lead to excessive bleeding or abnormal blood clotting (thrombosis).

Hypodysfibrinogenemia is a condition characterized by low levels of abnormally functioning fibrinogen protein in the blood. As in dysfibrinogenemia, this condition can result in excessive bleeding or thrombosis.

Other Names for This Gene

- FIBG_HUMAN
- fibrinogen gamma chain isoform gamma-A precursor
- fibrinogen gamma chain isoform gamma-B precursor
- fibrinogen, gamma polypeptide

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of FGG (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=2266[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28%28FGG%5BTIAB%5D%29+OR+%28fibrinogen+gamma+chain%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+1800+days%22%5Bdp%5D)

Catalog of Genes and Diseases from OMIM

- FIBRINOGEN, G GAMMA POLYPEPTIDE; FGG (https://omim.org/entry/134850)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/2266)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=FGG[gene])

References

- Neerman-Arbez M, de Moerloose P, Honsberger A, Parlier G, Arnuti B, Biron C, Borg JY, Eber S, Meili E, Peter-Salonen K, Ripoll L, Vervel C, d'Oiron R, StaegerP, Antonarakis SE, Morris MA. Molecular analysis of the fibrinogen gene clusterin 16 patients with congenital afibrinogenemia: novel truncating mutations in theFGA and FGG genes. Hum Genet. 2001 Mar;108(3):237-40. doi: 10.1007/s004390100469. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/11354637)
- Neerman-Arbez M. Molecular basis of fibrinogen deficiency. PathophysiolHaemost Thromb. 2006;35(1-2):187-98. doi: 10.1159/000093566. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/16855369)
- Weisel JW. Fibrinogen and fibrin. Adv Protein Chem. 2005;70:247-99. doi:10.1016/S0065-3233(05)70008-5. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/15837518)

Genomic Location

The *FGG* gene is found on chromosome 4 (https://medlineplus.gov/genetics/chromosome/4/).

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