TBXAS1 gene

thromboxane A synthase 1

Normal Function

The *TBXAS1* gene provides instructions for making an enzyme called thromboxane A synthase 1. This enzyme acts as part of a chemical pathway called the arachidonic acid cascade. Through this multistep pathway, a molecule called arachidonic acid is processed to produce several molecules with diverse functions in the body. As part of this pathway, thromboxane A synthase 1 converts a molecule called prostaglandin H_2 into another molecule called thromboxane A_2. Thromboxane A_2 is involved in normal blood clotting (hemostasis), playing critical roles in the narrowing of blood vessels (vasoconstriction) to slow blood flow and the clumping (aggregation) of blood cells called platelets at the site of an injury.

Studies suggest that the activity of thromboxane A synthase 1 may also be important for bone remodeling, which is a normal process in which old bone is removed and new bone is created to replace it, and for the production of red blood cells in bone marrow.

Health Conditions Related to Genetic Changes

Ghosal hematodiaphyseal dysplasia

At least four mutations in the *TBXAS1* gene have been found to cause Ghosal hematodiaphyseal dysplasia. This condition is characterized by abnormally thick bones and a shortage of red blood cells (anemia) caused by scarring (fibrosis) of the bone marrow.

Each of the known mutations changes a single protein building block (amino acid) in thromboxane A synthase 1, which severely reduces the activity of the enzyme. A shortage of this enzyme's activity prevents the conversion of prostaglandin H_2 to thromboxane A_2. As a result, cells have more prostaglandin H_2 than usual. Prostaglandin H_2 is converted into several related molecules, including prostaglandin E_2, which is thought to be involved in bone remodeling and in controlling the growth of immature red blood cells. Researchers speculate that an increase in prostaglandin E_2 levels resulting from excess prostaglandin H_2 contributes to the bone abnormalities and anemia that occur in people with Ghosal hematodiaphyseal dysplasia. However, the exact mechanism by which a lack of thromboxane A synthase 1 activity leads to the particular features of this condition is still unclear.

A shortage of thromboxane A synthase 1 activity also reduces the level of thromboxane A_2 in cells. Although this molecule plays a critical role in hemostasis, people with Ghosal hematodiaphyseal dysplasia do not appear to have problems with blood clotting. Researchers suspect that other molecules involved in vasoconstriction and platelet aggregation may be able to compensate for the lack of thromboxane A_2 in these individuals.

Other Names for This Gene

- BDPLT14
- CYP5
- CYP5A1
- cytochrome P450 5A1
- cytochrome P450, family 5, subfamily A, polypeptide 1
- GHOSAL
- platelet, cytochrome P450, subfamily V
- THAS
- THAS_HUMAN
- thromboxane A synthase 1 (platelet)
- thromboxane A synthase 1 (platelet, cytochrome P450, family 5, subfamily A)
- thromboxane-A synthase
- TS
- TXA synthase
- TXAS
- TXS

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of TBXAS1 (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=6916[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28%28TBXAS1%5BTIAB%5D%29+OR+%28thromboxane+A+synthase%5BTIAB%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D)

Catalog of Genes and Diseases from OMIM

- THROMBOXANE A SYNTHASE 1; TBXAS1 (https://omim.org/entry/274180)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/6916)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=TBXAS1[gene])

References

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- Isidor B, Dagoneau N, Huber C, Genevieve D, Bader-Meunier B, Blanche S, PicardC, De Vernejoul MC, Munnich A, Le Merrer M, Cormier-Daire V. A gene responsiblefor Ghosal hemato-diaphyseal dysplasia maps to chromosome 7q33-34. Hum Genet.2007 Apr;121(2):269-73. doi: 10.1007/s00439-006-0311-1. Epub 2007 Jan 3. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/17203301)
- Miyata A, Yokoyama C, Ihara H, Bandoh S, Takeda O, Takahashi E, Tanabe T. Characterization of the human gene (TBXAS1) encoding thromboxane synthase. Eur JBiochem. 1994 Sep 1;224(2):273-9. doi: 10.1111/j.1432-1033.1994.00273.x. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/7925341)

Genomic Location

The *TBXAS1* gene is found on chromosome 7 (https://medlineplus.gov/genetics/chromosome/7/).

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