FGD1 gene
FYVE, RhoGEF and PH domain containing 1

Normal Function

The FGD1 gene provides instructions for making a protein that functions as a guanine nucleotide exchange factor (GEF). GEFs turn on (activate) proteins called GTPases, which play an important role in chemical signaling within cells. GTPases are turned off (inactivated) when they are attached (bound) to a molecule called GDP and are turned on (activated) when they are bound to another molecule called GTP.

The FGD1 protein activates the GTPase known as Cdc42 by stimulating the exchange of GDP for GTP. Once Cdc42 is active, it transmits signals that are critical for various aspects of development before and after birth, particularly the development of bones. The FGD1 protein may also be involved in maintenance (remodeling) of the extracellular matrix, which is the intricate lattice of proteins and other molecules that forms in the spaces between cells. Through this process, the protein appears to play a role in cell movement (migration) and the remodeling of blood vessels.

Health Conditions Related to Genetic Changes

Aarskog-Scott syndrome

More than 40 mutations in the FGD1 gene have been found to cause Aarskog-Scott syndrome, a rare condition that occurs primarily in males. Affected boys typically have distinctive facial features, genital abnormalities, childhood short stature, and other skeletal abnormalities. The FGD1 gene mutations lead to the production of an abnormally functioning FGD1 protein, which disrupts Cdc42 signaling. Altering the transmission of Cdc42 signals likely impairs normal development of bones and other tissues, resulting in the wide variety of abnormalities that occur in people with Aarskog-Scott syndrome.
Chromosomal Location

Cytogenetic Location: Xp11.22, which is the short (p) arm of the X chromosome at position 11.22

Molecular Location: base pairs 54,445,454 to 54,496,234 on the X chromosome (Homo sapiens Updated Annotation Release 109.20200228, GRCh38.p13) (NCBI)

Credit: Genome Decoration Page/NCBI

Other Names for This Gene

• AAS
• faciogenital dysplasia protein
• FGD1_HUMAN
• FGDY
• ZFYVE3

Additional Information & Resources

Educational Resources

• Eurekah Bioscience Collection: The Rho GDP/GTP Cycle Is Regulated by GEFs and GAPs
  https://www.ncbi.nlm.nih.gov/books/NBK6594/#A39190

• Molecular Biology of the Cell (fourth edition, 2002): Regulatory Proteins Control the Activity of GTP-Binding Proteins by Determining Whether GTP or GDP Is Bound
  https://www.ncbi.nlm.nih.gov/books/NBK26911/#A515

Scientific Articles on PubMed

• PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28FGD1%5BTIAB%5D%29+OR+%28faciogenital+dysplasia+protein%5BTIAB%5D%29+OR+%28FGDY%5BTIAB%5D%29+NOT+%28glucocorticoid%29+OR+%28FGD4%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+3600+days+22%5Bdp%5D
Catalog of Genes and Diseases from OMIM

- FYVE, RhoGEF, AND PH DOMAIN-CONTAINING PROTEIN 1
  http://omim.org/entry/300546

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
  http://atlasgeneticsoncology.org/Genes/GC_FGD1.html

- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=FGD1%5Bgene%5D

- HGNC Gene Symbol Report

- Monarch Initiative
  https://monarchinitiative.org/gene/NCBIGene:2245

- NCBI Gene

- UniProt
  https://www.uniprot.org/uniprot/P98174

Sources for This Summary

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/21911474
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3209245/

- Estrada L, Caron E, Gorski JL. Fgd1, the Cdc42 guanine nucleotide exchange factor responsible for faciogenital dysplasia, is localized to the subcortical actin cytoskeleton and Golgi membrane. Hum Mol Genet. 2001 Mar 1;10(5):485-95.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/11181572

- OMIM: FYVE, RhoGEF, AND PH DOMAIN-CONTAINING PROTEIN 1
  http://omim.org/entry/300546

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/21356349
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3070587/

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/10906777
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/12913069

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/14560308

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/21212517

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/27199457

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