ACVR1 gene
activin A receptor type 1

Normal Function

The ACVR1 gene provides instructions for making the activin receptor type I protein, which is a member of a protein family called bone morphogenetic protein (BMP) type I receptors. BMP receptors span the cell membrane, so that one end of the protein remains inside the cell and the other end projects from the outer surface of the cell. This arrangement allows receptors to receive signals from outside the cell and transmit them inside to affect cell development and function.

Activin receptor type I is found in many tissues of the body including skeletal muscle and cartilage. It helps to control the growth and development of the bones and muscles, including the gradual replacement of cartilage by bone (ossification). This process occurs in normal skeletal maturation from birth to young adulthood.

Activin receptor type I is normally activated at appropriate times by molecules called ligands. Activation may occur when these ligands, such as BMPs, attach (bind) to the receptor or to other proteins with which it forms a complex. A protein called FKBP12 can inhibit activin receptor type I by binding to the receptor and preventing inappropriate (leaky) activation in the absence of ligand.

Health Conditions Related to Genetic Changes

Fibrodysplasia ossificans progressiva

All individuals with a definite diagnosis of fibrodysplasia ossificans progressiva have a mutation in which the protein building block (amino acid) histidine is substituted for the amino acid arginine at position 206 of the ACVR1 protein (written as Arg206His or R206H). Researchers believe that under certain conditions this mutation may change the shape of the receptor. This shape change may disrupt the binding of an inhibitor protein such as FKBP12 or interfere with other mechanisms that control activation. As a result, the receptor may be constantly activated (constitutive activation), even in the absence of ligands. Constitutive activation of the receptor causes overgrowth of bone and cartilage and fusion of joints, resulting in the signs and symptoms of fibrodysplasia ossificans progressiva.
Chromosomal Location

Cytogenetic Location: 2q24.1, which is the long (q) arm of chromosome 2 at position 24.1

Molecular Location: base pairs 157,736,446 to 157,875,896 on chromosome 2 (Homo sapiens Annotation Release 109, GRCh38.p12) (NCBI)

Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- activin A receptor type I
- activin A receptor, type I
- activin A receptor, type II-like kinase 2
- activin A type I receptor
- activin A type I receptor precursor
- ActR-IA protein, human
- ACTRI
- ACVR1_HUMAN
- ACVR1A
- ACVRLK2
- ALK2
- hydroxyalkyl-protein kinase
- SKR1
Additional Information & Resources

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28ACVR1%5BTIAB%5D%29+OR+%28%28ALK2%5BTIAB%5D%29+OR+%28SKR1%5BTIAB%5D%29+OR+%28ACTRI%5BTIAB%5D%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+3600+days%22%5Bdp%5D

Catalog of Genes and Diseases from OMIM

- ACTIVIN A RECEPTOR, TYPE I
  http://omim.org/entry/102576

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
  http://atlasgeneticsoncology.org/Genes/ACVR1ID564ch2q24.html
- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=ACVR1%5Bgene%5D
- HGNC Gene Symbol Report
- Monarch Initiative
  https://monarchinitiative.org/gene/NCBIGene:90
- NCBI Gene
- UniProt
  https://www.uniprot.org/uniprot/Q04771

Sources for This Summary

- OMIM: ACTIVIN A RECEPTOR, TYPE I
  http://omim.org/entry/102576
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/15621726
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/16753021
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/17572636
Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/17477807

Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/17077940

Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/17351709

Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/17516498

Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/15671031

Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/16642017

Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/12968668

Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/15289457 
Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC517404/

Reprinted from Genetics Home Reference: 
https://ghr.nlm.nih.gov/gene/ACVR1

Reviewed: August 2007 
Published: March 19, 2019