GJB6 gene

Normal Function

The GJB6 gene provides instructions for making a protein called gap junction beta 6, more commonly known as connexin 30. Connexin 30 is a member of the connexin protein family. Connexin proteins form channels called gap junctions that permit the transport of nutrients, charged atoms (ions), and signaling molecules between adjoining cells. The size of the gap junction and the types of particles that move through it are determined by the particular connexin proteins that make up the channel. Gap junctions made with connexin 30 transport potassium ions and certain small molecules.

Connexin 30 is found in several different tissues throughout the body, including the brain, inner ear, skin (especially the palms of the hands and soles of the feet), hair follicles, and nail beds. Because of its presence in the inner ear, researchers are interested in this protein's role in hearing. Hearing requires the conversion of sound waves to electrical nerve impulses. This conversion involves many processes, including maintenance of the proper level of potassium ions in the inner ear. Some studies indicate that gap junctions made with connexin 30 help to maintain the correct level of potassium ions.

Health Conditions Related to Genetic Changes

Clouston syndrome

At least four GJB6 gene mutations have been identified in people with a skin disorder called Clouston syndrome, which is also known as hidrotic ectodermal dysplasia 2. Characteristics of Clouston syndrome include fingernail abnormalities, hair loss, and thickened skin on the palms of the hands and soles of the feet. The GJB6 gene mutations that cause Clouston syndrome change single protein building blocks (amino acids) in the connexin 30 protein. Although the effects of these mutations are not fully understood, they lead to abnormalities in the growth, division, and maturation of cells in the hair follicles, nails, and skin.

Nonsyndromic hearing loss

Researchers have identified a few GJB6 gene mutations in individuals with nonsyndromic hearing loss, which is loss of hearing that is not associated with other signs and symptoms. Mutations in this gene cause a form of nonsyndromic hearing loss called DFNA3. This form of hearing loss can either be present before a child learns to speak (prelingual) or begin after a child learns to speak (postlingual). The hearing loss ranges from mild to profound, becomes more severe over time, and particularly affects the ability to hear high-frequency sounds.
At least two *GJB6* gene mutations have been reported to cause DFNA3. Each of these mutations changes a single amino acid in connexin 30. The mutations are described as "dominant negative" because they lead to an abnormal version of connexin 30 that appears to block the formation of functional gap junctions. A shortage of these channels may alter the level of potassium ions in the inner ear, which would disrupt the conversion of sound waves to nerve impulses.

**Chromosomal Location**

Cytogenetic Location: 13q12.11, which is the long (q) arm of chromosome 13 at position 12.11

Molecular Location: base pairs 20,221,962 to 20,232,395 on chromosome 13 (Homo sapiens Annotation Release 109, GRCh38.p12) (NCBI)

Credit: Genome Decoration Page/NCBI

**Other Names for This Gene**

- CX30
- CXB6_HUMAN
- DFNA3
- ED2
- EDH
- gap junction protein, beta 6
- gap junction protein, beta 6, 30kDa
- HED
Additional Information & Resources

Educational Resources

• Biochemistry (fifth edition, 2002): Gap Junctions Allow Ions and Small Molecules to Flow between Communicating Cells
  https://www.ncbi.nlm.nih.gov/books/NBK22492/

• Madame Curie Bioscience Database: Gap Junctions: Cell-Cell Channels in Animals
  https://www.ncbi.nlm.nih.gov/books/NBK6455/

  https://www.ncbi.nlm.nih.gov/books/NBK26857/#A3494

Clinical Information from GeneReviews

• Hereditary Hearing Loss and Deafness Overview
  https://www.ncbi.nlm.nih.gov/books/NBK1434

• Hidrotic Ectodermal Dysplasia 2
  https://www.ncbi.nlm.nih.gov/books/NBK1200

• Nonsyndromic Hearing Loss and Deafness, DFNA3
  https://www.ncbi.nlm.nih.gov/books/NBK1536

Scientific Articles on PubMed

• PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28GJB6%5BTIAB%5D%29+OR+%28connexin+30%5BTIAB%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1080+days%22+AND+human%5Bdp%5D

Catalog of Genes and Diseases from OMIM

• GAP JUNCTION PROTEIN, BETA-6
  http://omim.org/entry/604418

Research Resources

• Atlas of Genetics and Cytogenetics in Oncology and Haematology
  http://atlasgeneticsoncology.org/Genes/GC_GJB6.html

• ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=GJB6%5Bgene%5D

• HGNC Gene Symbol Report

• Monarch Initiative
  https://monarchinitiative.org/gene/NCBIGene:10804
Sources for This Summary

  *Citation on PubMed:* https://www.ncbi.nlm.nih.gov/pubmed/18717672

  *Citation on PubMed:* https://www.ncbi.nlm.nih.gov/pubmed/20301379

  *Citation on PubMed:* https://www.ncbi.nlm.nih.gov/pubmed/23219093

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