ANK2 gene
ankyrin 2

Normal Function

The ANK2 gene provides instructions for making a protein called ankyrin-B. Ankyrin-B is part of a family of ankyrin proteins, which interact with many other types of proteins in cells throughout the body. Ankyrins help organize the cell's structural framework (the cytoskeleton) and link certain proteins that span the cell membrane to this framework. Additionally, ankyrins play key roles in important functions including cell movement (migration) and cell growth and division (proliferation).

The ankyrin-B protein is active in many cell types, particularly in the brain and in heart (cardiac) muscle. This protein mainly interacts with ion channels and ion transporters, which are complexes of proteins that move charged atoms (ions) across cell membranes. In the heart, the flow of ions (such as sodium, potassium, and calcium) through ion channels and ion transporters generates the electrical signals that control the heartbeat and maintain a normal heart rhythm. Ankyrin-B ensures these channels and transporters are in their proper locations in the cell membrane so they can regulate the flow of ions into and out of cardiac muscle cells. In addition, ankyrin-B helps ensure that signaling molecules that regulate the activity of ion channels and ion transporters are in the proper location.

Health Conditions Related to Genetic Changes

Ankyrin-B syndrome

At least ten mutations in the ANK2 gene have been found to cause ankyrin-B syndrome, a condition characterized by a variety of heart problems. Most often, mutations in the ANK2 gene lead to abnormalities of the heart's natural pacemaker (the sinoatrial node), a heart rate that is slower than normal (bradycardia), a disruption in the rhythm of the heart (arrhythmia), and an increased risk of fainting (syncope) and sudden death.

Each of the identified mutations in the ANK2 gene changes a single protein building block (amino acid) in the ankyrin-B protein. Most of these mutations alter a region of the ankyrin-B protein important for its function. At least one ANK2 gene mutation prevents ankyrin-B from getting to the cell membrane where it is needed to function. As a result of these genetic changes, the ankyrin-B protein cannot target ion channels and ion transporters to their correct locations in cardiac muscle cells. Although the channels and transporters are produced normally by the cell, they are unable to function if they are not inserted correctly into the cell membrane. This loss of functional channels and transporters in the heart disrupts the normal flow of ions,
which alters the heart's normal rhythm and leads to the heart problems that can be a part of ankyrin-B syndrome.

Autism spectrum disorder

Chromosomal Location

Cytogenetic Location: 4q25-q26, which is the long (q) arm of chromosome 4 between positions 25 and 26

Molecular Location: base pairs 112,706,018 to 113,383,740 on chromosome 4 (Homo sapiens Updated Annotation Release 109.20190905, GRCh38.p13) (NCBI)

Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- ANK2_HUMAN
- ankyrin 2, neuronal
- ankyrin-2, nonerythrocytic
- ankyrin B
- ankyrin, brain
- ankyrin, nonerythroid
- brank-2
- LQT4

Additional Information & Resources

Educational Resources

- Biochemistry (fifth edition, 2002): Specific Channels Can Rapidly Transport Ions Across Membranes
  https://www.ncbi.nlm.nih.gov/books/NBK22509/
Clinical Information from GeneReviews

- Long QT Syndrome

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28ANK2%5BTIAB%5D%29+OR+%28ankyrin+2,+neuronal%5BTIAB%5D%29%29+OR+%28%28ankyrin+B%5BTIAB%5D%29+OR+%28ankyrin,+brain%5BTIAB%5D%29+OR+%28ankyrin,+nonerythroid%5BTIAB%5D%29+OR+%28ankyrin-2,+nonerythrocytic%5BTIAB%5D%29+OR+%28LQT4%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+3600+days%22%5Bdp%5D

Catalog of Genes and Diseases from OMIM

- ANKYRIN 2
  http://omim.org/entry/106410

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
  http://atlasgeneticsoncology.org/Genes/GC_ANK2.html
- ClinVar
- HGNC Gene Symbol Report
- Monarch Initiative
  https://monarchinitiative.org/gene/NCBIGene:287
- NCBI Gene
- UniProt
  https://www.uniprot.org/uniprot/Q01484

Sources for This Summary

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/20301308
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/15191637