SCN10A gene

sodium voltage-gated channel alpha subunit 10

Normal Function

The *SCN10A* gene belongs to a family of genes that provide instructions for making sodium channels. These channels, which transport positively charged sodium atoms (sodium ions) into cells, play a key role in a cell's ability to generate and transmit electrical signals.

The *SCN10A* gene provides instructions for making one part (the alpha subunit) of a sodium channel called NaV1.8. NaV1.8 sodium channels are found in nerve cells called nociceptors that transmit pain signals. Nociceptors are part of the peripheral nervous system, which connects the brain and spinal cord to cells that detect sensations such as touch, smell, and pain. Nociceptors are primarily involved in transmitting pain signals. The centers of nociceptors, known as the cell bodies, are located in a part of the spinal cord called the dorsal root ganglion. Fibers called axons extend from the cell bodies, reaching throughout the body to receive sensory information. In addition to nociceptors, NaV1.8 sodium channels have also been found in heart muscle cells where, by controlling the flow of sodium ions, they likely play a role in maintaining a normal heart rhythm.

Health Conditions Related to Genetic Changes

Small fiber neuropathy

Mutations in the *SCN10A* gene account for approximately 5 percent of cases of small fiber neuropathy, a condition characterized by severe pain attacks and a reduced ability to differentiate between hot and cold. The mutations that cause this condition change single protein building blocks (amino acids) in the alpha subunit of the NaV1.8 sodium channel. Many of the mutations result in NaV1.8 sodium channels that open more easily than usual, increasing the flow of sodium ions that produce nerve impulses within nociceptors. This increase in sodium ions enhances transmission of pain signals, causing individuals to be more sensitive to stimulation that might otherwise not cause pain. In this condition, the small fibers that extend from the nociceptors and transmit pain signals (axons) degenerate over time. The cause of this degeneration is unknown, but it likely accounts for signs and symptoms such as the loss of temperature differentiation.

Other disorders

Certain common variants (polymorphisms) in the *SCN10A* gene have been found to increase the risk of developing an irregular heartbeat (arrhythmia). These polymorphisms lead to the production of an altered NaV1.8 sodium channel that can disrupt the electrical signals that control the heartbeat. Specifically, changes in the *SCN10A* gene are associated with a type of arrhythmia known as heart block. Heart block occurs when the heart's electrical signals are slowed down or interrupted. It is unknown how changes to the NaV1.8 sodium channel lead to heart block.

Other Names for This Gene

- hPN3
- Nav1.8
- peripheral nerve sodium channel 3
- PN3
- SCNAA_HUMAN
- sodium channel protein type 10 subunit alpha
- sodium channel protein type X subunit alpha
- sodium channel, voltage gated, type X alpha subunit
- sodium channel, voltage-gated, type X, alpha polypeptide
- sodium channel, voltage-gated, type X, alpha subunit
- voltage-gated sodium channel subunit alpha Nav1.8

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of SCN10A (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=6336[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28SCN10A%5BTIAB%5D%29+OR+%28Nav1.8%5BTIAB%5D%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

- SODIUM VOLTAGE-GATED CHANNEL, ALPHA SUBUNIT 10; SCN10A (https://omim.org/entry/604427)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/6336)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=SCN10A[gene])

References

- Chambers JC, Zhao J, Terracciano CM, Bezzina CR, Zhang W, Kaba R, Navaratnarajah M, Lotlikar A, Sehmi JS, Kooner MK, Deng G, Siedlecka U, Parasramka S, El-Hamamsy I, Wass MN, Dekker LR, de Jong JS, Sternberg MJ, McKennaW, Severs NJ, de Silva R, Wilde AA, Anand P, Yacoub M, Scott J, Elliott P, WoodJN, Kooner JS. Genetic variation in SCN10A influences cardiac conduction. NatGenet. 2010 Feb;42(2):149-52. doi: 10.1038/ng.516. Epub 2010 Jan 10. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/20062061)
- Faber CG, Lauria G, Merkies IS, Cheng X, Han C, Ahn HS, Persson AK, Hoeijmakers JG, Gerrits MM, Pierro T, Lombardi R, Kapetis D, Dib-Hajj SD, WaxmanSG. Gain-of-function Nav1.8 mutations in painful neuropathy. Proc Natl Acad Sci US A. 2012 Nov 20;109(47):19444-9. doi: 10.1073/pnas.1216080109. Epub 2012 Oct 31. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/23115331) or Free article on PubMed Central (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3511073/)
- Facer P, Punjabi PP, Abrari A, Kaba RA, Severs NJ, Chambers J, Kooner JS, Anand P. Localisation of SCN10A gene product Na(v)1.8 and novel pain-related ionchannels in human heart. Int Heart J. 2011;52(3):146-52. doi: 10.1536/ihj.52.146. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/21646736)

Genomic Location

The *SCN10A* gene is found on chromosome 3 (https://medlineplus.gov/genetics/chromosome/3/).

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