

HCN4 gene

hyperpolarization activated cyclic nucleotide gated potassium channel 4

Normal Function

The *HCN4* gene provides instructions for making a channel that transports positively charged atoms (ions) into heart muscle cells. This channel is located primarily in the sino-atrial (SA) node, which is an area of specialized cells in the heart that functions as a natural pacemaker. The HCN4 channel allows potassium and sodium ions to flow into cells of the SA node. This ion flow is often called the "pacemaker current" because it generates electrical impulses that start each heartbeat and is involved in maintaining a regular heart rhythm.

Health Conditions Related to Genetic Changes

Sick sinus syndrome

At least five mutations in the *HCN4* gene have been identified in people with sick sinus syndrome, a heart condition that affects the function of the SA node. Most of these mutations change single protein building blocks (amino acids) in the HCN4 channel. In some cases, fewer of the altered channels reach the cell membrane, where they are needed to transport ions. In other cases, the channel is in the right place but has an abnormal structure that changes how ions flow through it. All of the mutations reduce the overall flow of ions into cells of the SA node, preventing it from creating the electrical signals that control the heartbeat. These changes increase the risk of an abnormally slow heartbeat (bradycardia), which can cause dizziness, light-headedness, fainting (syncope), and related symptoms. *HCN4* gene mutations have also been found in people who have a slow heartbeat without any other symptoms (asymptomatic bradycardia).

Brugada syndrome

MedlinePlus Genetics provides information about Brugada syndrome

Left ventricular noncompaction

MedlinePlus Genetics provides information about Left ventricular noncompaction

Other Names for This Gene

- HCN4_HUMAN
- hyperpolarization activated cyclic nucleotide-gated cation channel 4
- hyperpolarization activated cyclic nucleotide-gated potassium channel 4
- potassium/sodium hyperpolarization-activated cyclic nucleotide-gated channel 4
- SSS2

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of HCN4 ([https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=10021\[geneid\]](https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=10021[geneid]))

Scientific Articles on PubMed

- PubMed (<https://pubmed.ncbi.nlm.nih.gov/?term=%28HCN4%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

- HYPERPOLARIZATION-ACTIVATED CYCLIC NUCLEOTIDE-GATED POTASSIUM CHANNEL 4; HCN4 (<https://omim.org/entry/605206>)

Gene and Variant Databases

- NCBI Gene (<https://www.ncbi.nlm.nih.gov/gene/10021>)
- ClinVar ([https://www.ncbi.nlm.nih.gov/clinvar?term=HCN4\[gene\]](https://www.ncbi.nlm.nih.gov/clinvar?term=HCN4[gene]))

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Genomic Location

The *HCN4* gene is found on chromosome 15 (<https://medlineplus.gov/genetics/chromosome/15/>).

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