KCNT1 gene

potassium sodium-activated channel subfamily T member 1

Normal Function

The *KCNT1* gene belongs to a large family of genes that provide instructions for making potassium channels. These channels, which transport positively charged atoms (ions) of potassium into and out of cells, play a key role in a cell's ability to generate and transmit electrical signals.

The specific function of a potassium channel depends on its protein components and its location in the body. Channels made with the KCNT1 protein are active in nerve cells (neurons) in the brain, where they transport potassium ions out of cells. This flow of ions is involved in generating currents to activate (excite) neurons and send signals in the brain.

Potassium channels are made up of several protein components (subunits). Each channel contains four alpha subunits that form the hole (pore) through which potassium ions move. Four alpha subunits from the *KCNT1* gene can form a channel. The KCNT1 alpha subunits can also interact with alpha subunits produced from the *KCNT2* gene to form a functional potassium channel.

Researchers have determined that a molecule called PKC can turn on channels made with the KCNT1 protein. While the channels can generate electrical currents without PKC, when PKC turns the channel on, the currents are stronger.

Health Conditions Related to Genetic Changes

Autosomal dominant nocturnal frontal lobe epilepsy

Variants (also called mutations) in the *KCNT1* gene have been found in several people with autosomal dominant nocturnal frontal lobe epilepsy (ADNFLE). This condition causes seizures that usually occur at night (nocturnally) while an affected person is sleeping. In addition to seizures, most affected individuals with *KCNT1* gene mutations have psychiatric problems, such as aggression, episodes of unresponsiveness (catatonia), or a distorted view of reality (psychosis). About half of affected individuals have intellectual disability.

The *KCNT1* gene variants involved in this condition change single protein building blocks (amino acids) in the KCNT1 protein. It is unclear what effects these protein

changes have on the function of potassium channels or how they lead to the features of ADNFLE.

Malignant migrating partial seizures of infancy

KCNT1 gene variants have been found in individuals with malignant migrating partial seizures of infancy (MMPSI). This condition is characterized by recurrent seizures beginning before the age of 6 months as well as profound developmental delay. In MMPSI, seizure activity in the brain can spread (migrate) from one region to another during an episode.

The *KCNT1* gene variants involved in MMPSI change single amino acids in the KCNT1 protein. The electrical currents generated by potassium channels made with the altered KCNT1 protein are abnormally increased, as though the channels were turned on by PKC. The increased electrical currents allow unregulated excitation of neurons in the brain. When neurons are abnormally excited, seizures develop. Repeated seizures contribute to the developmental delay that is characteristic of this condition.

Other Names for This Gene

- EIEE14
- ENFL5
- KCa4.1
- KCNT1_HUMAN
- KIAA1422
- potassium channel subfamily T member 1
- potassium channel, sodium activated subfamily T, member 1
- potassium channel, subfamily T, member 1
- SLACK
- Slo2.2

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of KCNT1 (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=57582[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28KCNT1%5BTIAB%5D%29+OR+%28SLACK%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

- POTASSIUM CHANNEL, SUBFAMILY T, MEMBER 1; KCNT1 (https://omim.org/entry/608167)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/57582)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=KCNT1[gene])

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Genomic Location

The *KCNT1* gene is found on chromosome 9 (https://medlineplus.gov/genetics/chromosome/9/).

Last updated March 1, 2014