HINT1 gene

histidine triad nucleotide binding protein 1

Normal Function

The *HINT1* gene provides instructions for making a protein called histidine triad nucleotide-binding protein 1 (HINT1). The function of this protein is not clear. Laboratory studies show that the HINT1 protein has the ability to attach (bind) to certain types of molecules called nucleotides. HINT1 breaks down particular nucleotides through a process called hydrolysis. However, it is not known if the HINT1 protein performs the same reaction in the body or what effects it has.

Although the mechanisms are not completely understood, the HINT1 protein is involved in the nervous system. In nerve cells (neurons), HINT1 binds to signaling proteins called receptors that relay signals affecting nervous system function. HINT1 appears to stabilize the interaction of different receptors and regulate the effects of their signaling.

The HINT1 protein is also involved in programmed cell death (apoptosis), which occurs when cells are no longer needed. In addition, by blocking the activity of certain genes, HINT1 acts as a tumor suppressor, which means that it keeps cells from growing and dividing too rapidly or in an uncontrolled way.

Health Conditions Related to Genetic Changes

Autosomal recessive axonal neuropathy with neuromyotonia

At least nine mutations in the *HINT1* gene have been found to cause autosomal recessive axonal neuropathy with neuromyotonia. This neurological condition affects the peripheral nerves, which connect the brain and spinal cord to muscles and to sensory cells that detect sensations such as touch. People with this condition typically have muscle weakness in the feet, legs, and hands and delayed relaxation of muscles after tensing (neuromyotonia). Some affected individuals have mildly impaired sensations.

The *HINT1* gene mutations that cause this condition change single protein building blocks (amino acids) in the HINT1 protein. These changes reduce or eliminate the protein's ability to perform the hydrolysis reaction. Sometimes the altered protein is broken down prematurely. It is not clear how loss of functional HINT1 protein affects the peripheral nerves or leads to the signs and symptoms of this condition.

Charcot-Marie-Tooth disease

MedlinePlus Genetics provides information about Charcot-Marie-Tooth disease

Other Names for This Gene

- adenosine 5'-monophosphoramidase
- HINT
- histidine triad nucleotide-binding protein 1
- NMAN
- PKCI-1
- PRKCNH1
- protein kinase C inhibitor 1
- protein kinase C-interacting protein 1

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of HINT1 (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=3094[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28%28HINT1%5BTIAB%5D%29+OR+%28histidine+triad+nucleotide+binding+protein+1%5BTIAB%5D%29%29+OR+%28%28histidine+triad+nucleotide-binding+protein+1%5BTIAB%5D%29+OR+%28NMAN%5BTIAB%5D%29+OR+%28PKCI-1%5BTIAB%5D%29+OR+%28PRKCNH1%5BTIAB%5D%29+OR+%28protein+kinase+C+inhibitor+1%5BTIAB%5D%29+OR+%28protein+kinase+C-interacting+protein+1%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

- HISTIDINE TRIAD NUCLEOTIDE-BINDING PROTEIN 1; HINT1 (https://omim.org/entry/601314)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/3094)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=HINT1[gene])

References

- Caetano JS, Costa C, Baets J, Zimon Phd M, Venancio Phd M, Saraiva Phd J, Negrao L, Fineza I. Autosomal recessive axonal neuropathy with neuromyotonia: arare entity. Pediatr Neurol. 2014 Jan;50(1):104-7. doi:10.1016/j.pediatrneurol.2013.08.028. Epub 2013 Oct 13. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/24131582)
- Rodriguez-Munoz M, Sanchez-Blazquez P, Vicente-Sanchez A, Bailon C,Martin-Aznar B, Garzon J. The histidine triad nucleotide-binding protein 1supports mu-opioid receptor-glutamate NMDA receptor cross-regulation. Cell MolLife Sci. 2011 Sep;68(17):2933-49. doi: 10.1007/s00018-010-0598-x. Epub 2010 Dec14. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/21153910)
- Vicente-Sanchez A, Sanchez-Blazquez P, Rodriguez-Munoz M, Garzon J. HINT1protein cooperates with cannabinoid 1 receptor to negatively regulate glutamateNMDA receptor activity. Mol Brain. 2013 Oct 5;6:42. doi: 10.1186/1756-6606-6-42. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/24093505) or Free article on PubMed Central (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3851374/)
- Weiske J, Huber O. The histidine triad protein Hint1 interacts with Pontin andReptin and inhibits TCF-beta-catenin-mediated transcription. J Cell Sci. 2005 Jul15;118(Pt 14):3117-29. doi: 10.1242/jcs.02437. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/16014379)
- Weiske J, Huber O. The histidine triad protein Hint1 triggers apoptosisindependent of its enzymatic activity. J Biol Chem. 2006 Sep 15;281(37):27356-66.doi: 10.1074/jbc.M513452200. Epub 2006 Jul 11. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/16835243)
- Zhao H, Race V, Matthijs G, De Jonghe P, Robberecht W, Lambrechts D, Van DammeP. Exome sequencing reveals HINT1 mutations as a cause of distal hereditary motorneuropathy. Eur J Hum Genet. 2014 Jun;22(6):847-50. doi: 10.1038/ejhg.2013.231.Epub 2013 Oct 9. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/24105373) or Free article on PubMed Central (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4023208/)
- Zhou X, Chou TF, Aubol BE, Park CJ, Wolfenden R, Adams J, Wagner CR. Kineticmechanism of human histidine triad nucleotide binding protein 1. Biochemistry.2013 May 21;52(20):3588-600. doi: 10.1021/bi301616c. Epub 2013 May 7. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/23614568) or Free article on PubMed Central (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3835729/)
- Zimon M, Baets J, Almeida-Souza L, De Vriendt E, Nikodinovic J, Parman Y, Battaloglu E, Matur Z, Guergueltcheva V, Tournev I, Auer-Grumbach M, De Rijk P, Petersen BS, Muller T, Fransen E, Van Damme P, Loscher WN, Barisic N, Mitrovic Z,Previtali SC, Topaloglu H, Bernert G, Beleza-Meireles A, Todorovic S,Savic-Pavicevic D, Ishpekova B, Lechner S, Peeters K, Ooms T, Hahn AF, Zuchner S, Timmerman V, Van Dijck P, Rasic VM, Janecke AR, De Jonghe P, Jordanova A. Loss-of-function mutations in HINT1 cause axonal neuropathy with neuromyotonia. Nat Genet. 2012 Oct;44(10):1080-3. doi: 10.1038/ng.2406. Epub 2012 Sep 9.

Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/22961002)

Genomic Location

The *HINT1* gene is found on chromosome 5 (https://medlineplus.gov/genetics/chromosome/5/).

Last updated September 1, 2014