

HNRNPK gene

heterogeneous nuclear ribonucleoprotein K

Normal Function

The *HNRNPK* gene provides instructions for making a protein called heterogeneous nuclear ribonucleoprotein K (hnRNP K). This protein attaches (binds) to DNA or its chemical cousin RNA and to other proteins. It acts as a docking site to bring together different molecules in the cell, which is important for relaying signals and controlling cellular functions. By bringing certain proteins together with DNA or RNA, the hnRNP K protein helps control the activity of genes and the production of proteins. By regulating gene activity and protein production, hnRNP K is involved in many cellular processes, including growth and division (proliferation) of cells, maturation of cells to take on specialized function (differentiation), and self-destruction (apoptosis) of cells when they are no longer needed.

The hnRNP K protein plays a role in the normal development or function of many body systems. In the brain, the protein may be involved in a process called synaptic plasticity, which is the ability of the connections between neurons (synapses) to change and adapt over time in response to experience. This process is critical for learning and memory. Another process in the brain involving the hnRNP K protein is the growth of nerve cell extensions called axons, which are essential for transmission of nerve impulses. While the protein is likely critical in other systems and processes, its role is not well understood.

Health Conditions Related to Genetic Changes

Au-Kline syndrome

More than 20 mutations in the *HNRNPK* gene have been found to cause Au-Kline syndrome. This condition is characterized by weak muscle tone (hypotonia), intellectual disability, delayed development of speech and walking, and distinctive facial features. Other body systems, such as the heart, kidneys, and bones, may also be affected.

The *HNRNPK* gene mutations that cause Au-Kline syndrome alter the blueprint for making hnRNP K protein, which results in the production of little or no hnRNP K protein from one copy of the gene. A shortage of this protein changes gene activity and protein production in cells. As a result, the normal development or function of cells, tissues, and organs in many parts of the body is disrupted, leading to the varied features of Au-Kline

syndrome. In particular, problems with brain development likely contribute to intellectual disability, delayed development, and other neurological problems in people with the condition.

Cancers

Loss of the *HNRNPK* gene is thought to be involved in the development of a blood cancer known as acute myeloid leukemia (AML). A mutation that removes (deletes) DNA from the long (q) arm of chromosome 9 occurs in about 2 percent of AML cases. Such cases are referred to as del(9q) AML. The missing region of DNA includes the *HNRNPK* gene, among other genes. Researchers suspect that a shortage of hnRNP K protein alters the activity of genes that control cell growth, resulting in an excess of abnormal cells. When the del(9q) mutation occurs in certain blood cells, the shortage of hnRNP K may contribute to the uncontrolled cell growth that underlies AML.

Individuals with Au-Kline syndrome (described above) do not appear to have a higher risk of developing AML than does the general population.

Other Names for This Gene

- CSBP
- HNRPK
- transformation upregulated nuclear protein
- TUNP

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of HNRNPK ([https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=3190\[geneid\]](https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=3190[geneid]))

Scientific Articles on PubMed

- PubMed (<https://pubmed.ncbi.nlm.nih.gov/?term=%28%28HNRNPK%5BTIAB%5D%29+OR+%28heterogeneous+nuclear+ribonucleoprotein+K%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+1440+days%22%5Bdp%5D>)

Catalog of Genes and Diseases from OMIM

- HETEROGENEOUS NUCLEAR RIBONUCLEOPROTEIN K; HNRNPK (<https://omim.org/entry/600712>)

Gene and Variant Databases

- NCBI Gene (<https://www.ncbi.nlm.nih.gov/gene/3190>)
- ClinVar ([https://www.ncbi.nlm.nih.gov/clinvar?term=HNRNPK\[gene\]](https://www.ncbi.nlm.nih.gov/clinvar?term=HNRNPK[gene]))

References

- Au PYB, Goedhart C, Ferguson M, Breckpot J, Devriendt K, Wierenga K, Fanning E, Grange DK, Graham GE, Galarreta C, Jones MC, Kini U, Stewart H, Parboosingh JS, Kline AD, Innes AM; Care for Rare Canada Consortium. Phenotypic spectrum of Au-Kline syndrome: a report of six new cases and review of the literature. *Eur J Hum Genet.* 2018 Sep;26(9):1272-1281. doi: 10.1038/s41431-018-0187-2. Epub 2018 Jun 14. Citation on PubMed (<https://pubmed.ncbi.nlm.nih.gov/29904177>) or Free article on PubMed Central (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6117294/>)
- Au PYB, McNiven V, Phillips L, Innes AM, Kline AD. Au-Kline Syndrome. 2019 Apr 18 [updated 2024 Feb 1]. In: Adam MP, Feldman J, Mirzaa GM, Pagon RA, Wallace SE, Bean LJH, Gripp KW, Amemiya A, editors. *GeneReviews*(R) [Internet]. Seattle (WA): University of Washington, Seattle; 1993-2024. Available from <http://www.ncbi.nlm.nih.gov/books/NBK540283/> Citation on PubMed (<https://pubmed.ncbi.nlm.nih.gov/30998304>)
- Bomsztyk K, Denisenko O, Ostrowski J. hnRNP K: one protein multiple processes. *Bioessays.* 2004 Jun;26(6):629-38. doi: 10.1002/bies.20048. Citation on PubMed (<https://pubmed.ncbi.nlm.nih.gov/15170860>)
- Folci A, Mapelli L, Sassone J, Prestori F, D'Angelo E, Bassani S, Passafaro M. Loss of hnRNP K impairs synaptic plasticity in hippocampal neurons. *J Neurosci.* 2014 Jul 2;34(27):9088-95. doi: 10.1523/JNEUROSCI.0303-14.2014. Citation on PubMed (<https://pubmed.ncbi.nlm.nih.gov/24990929>) or Free article on PubMed Central (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6608249/>)
- Gallardo M, Lee HJ, Zhang X, Bueso-Ramos C, Pagon LR, McArthur M, Multani A, Nazha A, Manshouri T, Parker-Thornburg J, Rapado I, Quintas-Cardama A, Kornblau SM, Martinez-Lopez J, Post SM. hnRNP K Is a Haploinsufficient Tumor Suppressorthat Regulates Proliferation and Differentiation Programs in Hematologic Malignancies. *Cancer Cell.* 2015 Oct 12;28(4):486-499. doi:10.1016/j.ccell.2015.09.001. Epub 2015 Sep 24. Citation on PubMed (<https://pubmed.ncbi.nlm.nih.gov/26412324>) or Free article on PubMed Central (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4652598/>)
- Hutchins EJ, Szaro BG. c-Jun N-terminal kinase phosphorylation of heterogeneous nuclear ribonucleoprotein K regulates vertebrate axon outgrowth via a posttranscriptional mechanism. *J Neurosci.* 2013 Sep 11;33(37):14666-80. doi:10.1523/JNEUROSCI.4821-12.2013. Citation on PubMed (<https://pubmed.ncbi.nlm.nih.gov/24027268>) or Free article on PubMed Central (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6705169/>)
- Naarmann-de Vries IS, Sackmann Y, Klein F, Ostareck-Lederer A, Ostareck DH, Jost E, Ehninger G, Brummendorf TH, Marx G, Rollig C, Thiede C, Crysandt M. Characterization of acute myeloid leukemia with del(9q) - Impact of the genes in the

minimally deleted region. Leuk Res. 2019 Jan;76:15-23. doi:10.1016/j.leukres.2018.11.007. Epub 2018 Nov 17. Citation on PubMed (<https://pubmed.ncbi.nlm.nih.gov/30476680>)

- Okamoto N. Okamoto syndrome has features overlapping with Au-Kline syndrome and is caused by HNRNPK mutation. Am J Med Genet A. 2019 May;179(5):822-826. doi:10.1002/ajmg.a.61079. Epub 2019 Feb 21. Citation on PubMed (<https://pubmed.ncbi.nlm.nih.gov/30793470>)
- Sweetser DA, Peniket AJ, Haaland C, Blomberg AA, Zhang Y, Zaidi ST, Dayyani F, Zhao Z, Heerema NA, Boulton J, Dewald GW, Paietta E, Slovak ML, Willman CL, Wainscoat JS, Bernstein ID, Daly SB. Delineation of the minimal commonly deleted segment and identification of candidate tumor-suppressor genes in del(9q) acute myeloid leukemia. Genes Chromosomes Cancer. 2005 Nov;44(3):279-91. doi: 10.1002/gcc.20236. Citation on PubMed (<https://pubmed.ncbi.nlm.nih.gov/16015647>)
- Xu Y, Wu W, Han Q, Wang Y, Li C, Zhang P, Xu H. New Insights into the Interplay between Non-Coding RNAs and RNA-Binding Protein HnRNPK in Regulating Cellular Functions. Cells. 2019 Jan 17;8(1):62. doi: 10.3390/cells8010062. Citation on PubMed (<https://pubmed.ncbi.nlm.nih.gov/30658384>) or Free article on PubMed Central (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6357021/>)

Genomic Location

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

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