LIMK1 Gene

Subjects: Genetics & Heredity
Contributor: Dean Liu

LIM domain kinase 1

Keywords: genes

1. Introduction

The *LIMK1* gene provides instructions for making a protein that is highly active in the brain, where it is thought to be involved in the development of nerve cells. Studies suggest that this protein may play an important role in areas of the brain that are responsible for processing visual-spatial information (visuospatial constructive cognition). These parts of the brain are important for visualizing an object as a set of parts and performing tasks such as writing, drawing, constructing models, and assembling puzzles.

Within cells, the LIMK1 protein likely regulates aspects of the cytoskeleton, the structural framework that helps to determine cell shape, size, and movement. The LIMK1 protein helps control the organization of actin filaments, which are long, thin fibers that make up a significant part of the cytoskeleton. Actin filaments are necessary for several normal cellular functions, such as cell division, cell movement (motility), maintenance of cell shape, transport of proteins and other molecules within cells, and chemical signaling between cells.

2. Health Conditions Related to Genetic Changes

2.1. Williams Syndrome

The *LIMK1* gene is located in a region of chromosome 7 that is deleted in people with Williams syndrome. As a result of this deletion, people with this condition are missing one copy of the *LIMK1* gene in each cell. Some studies suggest that a loss of this gene contributes to the characteristic problems with visual-spatial tasks (such as writing and drawing) seen in Williams syndrome; however, other studies have not found this connection. Although a deletion of this gene probably affects the development and function of nerve cells in the brain, researchers have not determined how a reduction in the amount of LIMK1 protein could be related to the specific impairments seen in Williams syndrome.

2.2. Cancers

The LIMK1 protein is produced at unusually high levels (overexpressed) in some cancerous tumors. For example, increased amounts of this protein have been found in a form of skin cancer called melanoma and in cancers of the ovary, lung, breast, and prostate. Researchers believe that high levels of the LIMK1 protein may be associated with changes in the organization of actin filaments and an increased chance that a tumor will invade other tissues.

3. Other Names for This Gene

- LIM kinase
- LIM kinase 1
- LIM motif-containing protein kinase
- LIMK
- LIMK-1
- LIMK1_HUMAN

References

1. Davila M, Frost AR, Grizzle WE, Chakrabarti R. LIM kinase 1 is essential forthe invasive growth of prostate epithelial ce lls: implications in prostatecancer. J Biol Chem. 2003 Sep 19;278(38):36868-75.
2. Davila M, Jhala D, Ghosh D, Grizzle WE, Chakrabarti R. Expression of LIMkinase 1 is associated with reversible G1/S phase arrest, chromosomal instabilityand prostate cancer. Mol Cancer. 2007 Jun 8;6:40.
3. Gray V, Karmiloff-Smith A, Funnell E, Tassabehji M. In-depth analysis ofspatial cognition in Williams syndrome: A critica l assessment of the role of the LIMK1 gene. Neuropsychologia. 2006;44(5):679-85.
4. Hoogenraad CC, Akhmanova A, Galjart N, De Zeeuw CI. LIMK1 and CLIP-115:linking cytoskeletal defects to Williams s yndrome. Bioessays. 2004Feb;26(2):141-50. Review.
5. Meyer-Lindenberg A, Mervis CB, Sarpal D, Koch P, Steele S, Kohn P, Marenco S, Morris CA, Das S, Kippenhan S, Mat tay VS, Weinberger DR, Berman KF. Functional,structural, and metabolic abnormalities of the hippocampal formation in Williams syndrome. J Clin Invest. 2005 Jul;115(7):1888-95.
6. Morris CA, Mervis CB. Williams syndrome and related disorders. Annu RevGenomics Hum Genet. 2000;1:461-84. Revi ew.
7. Morris CA. Williams Syndrome. 1999 Apr 9 [updated 2017 Mar 23]. In: Adam MP,Ardinger HH, Pagon RA, Wallace SE, Bean LJH, Stephens K, Amemiya A, editors.GeneReviews® [Internet]. Seattle (WA): University of Washington, Seattle; 1993-2020. Available from http://www.ncbi.nlm.nih.gov/books/NBK1249/
8. Rosso S, Bollati F, Bisbal M, Peretti D, Sumi T, Nakamura T, Quiroga S,Ferreira A, Cáceres A. LIMK1 regulates Golgi d ynamics, traffic of Golgi-derivedvesicles, and process extension in primary cultured neurons. Mol Biol Cell. 2004 Jul;15 (7):3433-49.
9. Scott RW, Olson MF. LIM kinases: function, regulation and association withhuman disease. J Mol Med (Berl). 2007 Jun; 85(6):555-68.
10. Stanyon CA, Bernard O. LIM-kinase1. Int J Biochem Cell Biol. 1999Mar-Apr;31(3-4):389-94. Review.
11. Tassabehji M. Williams-Beuren syndrome: a challenge for genotype-phenotypecorrelations. Hum Mol Genet. 2003 Oct 15;12 Spec No 2:R229-37.Review.
12. Yoshioka K, Foletta V, Bernard O, Itoh K. A role for LIM kinase in cancerinvasion. Proc Natl Acad Sci U S A. 2003 Jun 1 0;100(12):7247-52.
