



VCAN gene

versican

Normal Function

The *VCAN* gene provides instructions for making a protein called versican. Versican is a type of protein known as a proteoglycan, which means it has several sugar molecules attached to it. Versican is found in the extracellular matrix of many different tissues and organs. The extracellular matrix is the intricate lattice of proteins and other molecules that forms in the spaces between cells. Versican interacts with many proteins and molecules to facilitate the assembly of the extracellular matrix and ensure its stability. Within the eye, versican interacts with other proteins to maintain the structure and gel-like consistency of the thick clear fluid that fills the eyeball (the vitreous).

Researchers have proposed several additional functions for versican. This protein likely helps regulate cell growth and division, the attachment of cells to one another (cell adhesion), and cell movement (migration). Studies suggest that versican plays a role in forming new blood vessels (angiogenesis), wound healing, inflammation, and preventing the growth of cancerous tumors. Versican also regulates the activity of several growth factors, which control a diverse range of processes important for cell growth.

Four different versions (isoforms) of the versican protein are produced from the *VCAN* gene. These isoforms (called V0, V1, V2, and V3) vary by size and by their location within the body.

Health Conditions Related to Genetic Changes

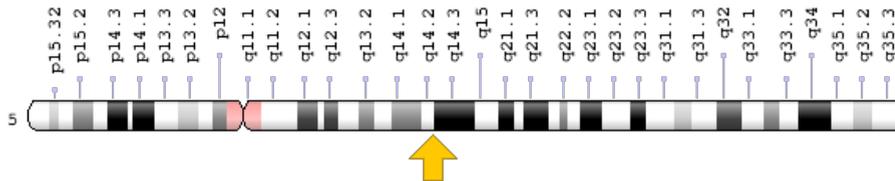
Wagner syndrome

At least 11 mutations in the *VCAN* gene have been found to cause Wagner syndrome, a condition that leads to progressive vision loss starting in childhood or early adulthood. The *VCAN* gene mutations that cause Wagner syndrome disrupt the way the gene's instructions are used to make versican. These mutations occur in two areas of the gene called intron 7 and exon 8; mutations in these regions lead to a decrease in the production of versican isoforms V0 and V1 and an increase in the production of isoforms V2 and V3. Researchers believe that this imbalance of versican isoforms in the vitreous impairs versican's interaction with other proteins, causing the vitreous to become unstable. This lack of stability in the vitreous affects other areas of the eye and contributes to the vision problems that occur in people with Wagner syndrome. It is unknown why *VCAN* gene mutations seem solely to affect vision.

Chromosomal Location

Cytogenetic Location: 5q14.2-q14.3, which is the long (q) arm of chromosome 5 between positions 14.2 and 14.3

Molecular Location: base pairs 83,471,674 to 83,582,303 on chromosome 5 (Homo sapiens Updated Annotation Release 109.20190607, GRCh38.p13) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- chondroitin sulfate proteoglycan 2
- CSPG2
- CSPG2_HUMAN
- glial hyaluronate-binding protein
- versican proteoglycan

Additional Information & Resources

Educational Resources

- Essentials of Glycobiology (second edition, 2009): Proteoglycans and Sulfated Glycosaminoglycans
<https://www.ncbi.nlm.nih.gov/books/NBK1900/>
- Madame Curie Bioscience Database: Proteoglycans
<https://www.ncbi.nlm.nih.gov/books/NBK6448/#A22214>

Clinical Information from GeneReviews

- VCAN-Related Vitreoretinopathy
<https://www.ncbi.nlm.nih.gov/books/NBK3821>

Scientific Articles on PubMed

- PubMed
<https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28VCAN%5BTIAB%5D%29+OR+%28versican%5BTI%5D%29+OR+%28CSPG2%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+1080+days%22%5Bdp%5D>

Catalog of Genes and Diseases from OMIM

- VERSICAN
<http://omim.org/entry/118661>

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
<http://atlasgeneticsoncology.org/Genes/VCANID40173ch5q14.html>
- ClinVar
<https://www.ncbi.nlm.nih.gov/clinvar?term=VCAN%5Bgene%5D>
- HGNC Gene Symbol Report
https://www.genenames.org/data/gene-symbol-report/#!/hgnc_id/HGNC:2464
- Monarch Initiative
<https://monarchinitiative.org/gene/NCBIGene:1462>
- NCBI Gene
<https://www.ncbi.nlm.nih.gov/gene/1462>
- UniProt
<https://www.uniprot.org/uniprot/P13611>

Sources for This Summary

- Kloeckener-Gruissem B, Bartholdi D, Abdou MT, Zimmermann DR, Berger W. Identification of the genetic defect in the original Wagner syndrome family. *Mol Vis*. 2006 Apr 17;12:350-5.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/16636652>
- Mukhopadhyay A, Nikopoulos K, Maugeri A, de Brouwer AP, van Nouhuys CE, Boon CJ, Perveen R, Zegers HA, Wittebol-Post D, van den Biesen PR, van der Velde-Visser SD, Brunner HG, Black GC, Hoyng CB, Cremers FP. Erosive vitreoretinopathy and wagner disease are caused by intronic mutations in CSPG2/Versican that result in an imbalance of splice variants. *Invest Ophthalmol Vis Sci*. 2006 Aug;47(8):3565-72.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/16877430>
- Rahmani M, Wong BW, Ang L, Cheung CC, Carthy JM, Walinski H, McManus BM. Versican: signaling to transcriptional control pathways. *Can J Physiol Pharmacol*. 2006 Jan;84(1):77-92. Review.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/16845893>

- Ronan SM, Tran-Viet KN, Burner EL, Metlapally R, Toth CA, Young TL. Mutational hot spot potential of a novel base pair mutation of the CSPG2 gene in a family with Wagner syndrome. Arch Ophthalmol. 2009 Nov;127(11):1511-9. doi: 10.1001/archophthalmol.2009.273.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/19901218>
Free article on PubMed Central: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3514888/>
- Theocharis DA, Skandalis SS, Noulas AV, Papageorgakopoulou N, Theocharis AD, Karamanos NK. Hyaluronan and chondroitin sulfate proteoglycans in the supramolecular organization of the mammalian vitreous body. Connect Tissue Res. 2008;49(3):124-8. doi: 10.1080/03008200802148496. Review.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/18661326>
- OMIM: VERSICAN
<http://omim.org/entry/118661>
- Wight TN. Versican: a versatile extracellular matrix proteoglycan in cell biology. Curr Opin Cell Biol. 2002 Oct;14(5):617-23. Review.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/12231358>
- Wu YJ, La Pierre DP, Wu J, Yee AJ, Yang BB. The interaction of versican with its binding partners. Cell Res. 2005 Jul;15(7):483-94. Review.
Citation on PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/16045811>

Reprinted from Genetics Home Reference:
<https://ghr.nlm.nih.gov/gene/VCAN>

Reviewed: January 2010
Published: September 10, 2019

Lister Hill National Center for Biomedical Communications
U.S. National Library of Medicine
National Institutes of Health
Department of Health & Human Services