DVL1 gene

dishevelled segment polarity protein 1

Normal Function

The *DVL1* gene provides instructions for making a protein that plays a critical role in development before birth. It is one of three DVL genes in humans (*DVL1*, *DVL2*, and *DVL3*). The proteins produced from these genes work together in chemical signaling pathways known as Wnt signaling. These pathways control the activity of certain genes and regulate the interactions between cells during embryonic development. Signaling involving the DVL proteins appears to be important for the normal development of the brain, skeleton, and many other parts of the body.

Health Conditions Related to Genetic Changes

Robinow syndrome

At least 15 mutations in the *DVL1* gene have been found to cause the autosomal dominant form of Robinow syndrome, a condition that affects the development of many parts of the body, particularly the skeleton. Autosomal dominant inheritance means that one copy of the altered gene in each cell is sufficient to cause the disorder. *DVL1* gene mutations underlie a variant type of autosomal dominant Robinow syndrome called the osteosclerotic form, which features increased bone mineral density (osteosclerosis) affecting the bones of the skull.

All of the identified *DVL1* gene mutations occur in a region of the gene known as exon 14. Each mutation is predicted to remove a segment of protein building blocks (amino acids) from the end of the DVL1 protein and add more than 100 new amino acids. Researchers are working to determine how these changes affect the protein's function. The changes may have a dominant-negative effect, which means that the altered protein produced from one copy of the *DVL1* gene interferes with the function of the normal protein produced from the other copy of the gene. Alternately, the changes may have a gain-of-function effect, giving the altered protein a new, as-yet-undetermined function. Either way, the abnormal DVL1 protein likely impairs Wnt signaling. Problems with Wnt signaling pathways disrupt the development of many organs and tissues, leading to the features of Robinow syndrome. It is unclear how *DVL1* gene mutations cause osteosclerosis in addition to the other signs and symptoms of the condition.

Other Names for This Gene

- dishevelled 1 (homologous to Drosophila dsh)
- dishevelled, dsh homolog 1
- dishevelled-1
- DRS2
- DSH homolog 1
- DVL
- DVL1L1
- DVL1P1
- segment polarity protein dishevelled homolog DVL-1

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of DVL1 (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=1855[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28%28DVL1%5BTIAB%5D%29+OR+%28dishevelled+segment+polarity+protein+1%5BTIAB%5D%29%29+OR+%28dishevelled+1%5BTIAB%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1800+days%22%5Bdp%5D)

Catalog of Genes and Diseases from OMIM

- DISHEVELLED 1; DVL1 (https://omim.org/entry/601365)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/1855)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=DVL1[gene])

References

- Bunn KJ, Daniel P, Rosken HS, O'Neill AC, Cameron-Christie SR, Morgan T, Brunner HG, Lai A, Kunst HP, Markie DM, Robertson SP. Mutations in DVL1 cause anosteosclerotic form of Robinow syndrome. Am J Hum Genet. 2015 Apr 2;96(4): 623-30.doi: 10.1016/j.ajhg.2015.02.010. Epub 2015 Mar 26. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/25817014) or Free article on PubMed Central (https://

www.ncbi.nlm.nih.gov/pmc/articles/PMC4385193/)

- Klingensmith J, Nusse R, Perrimon N. The Drosophila segment polarity genedishevelled encodes a novel protein required for response to the wingless signal.Genes Dev. 1994 Jan;8(1):118-30. doi: 10.1101/gad.8.1.118. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/8288125)
- Pizzuti A, Amati F, Calabrese G, Mari A, Colosimo A, Silani V, Giardino L,Ratti A, Penso D, Calza L, Palka G, Scarlato G, Novelli G, Dallapiccola B. cDNAcharacterization and chromosomal mapping of two human homologues of theDrosophila dishevelled polarity gene. Hum Mol Genet. 1996 Jul;5(7):953-8. doi: 10.1093/hmg/5.7.953. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/8817329)
- White J, Mazzeu JF, Hoischen A, Jhangiani SN, Gambin T, Alcino MC, Penney S, Saraiva JM, Hove H, Skovby F, Kayserili H, Estrella E, Vulto-van Silfhout AT, Steehouwer M, Muzny DM, Sutton VR, Gibbs RA; Baylor-Hopkins Center for MendelianGenomics; Lupski JR, Brunner HG, van Bon BW, Carvalho CM. DVL1 frameshiftmutations clustering in the penultimate exon cause autosomal-dominant Robinowsyndrome. Am J Hum Genet. 2015 Apr 2;96(4):612-22. doi:10.1016/j.ajhg.2015.02.015. Epub 2015 Mar 26. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/25817016) or Free article on PubMed Central (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4385180/)
- White JJ, Mazzeu JF, Coban-Akdemir Z, Bayram Y, Bahrambeigi V, Hoischen A, vanBon BWM, Gezdirici A, Gulec EY, Ramond F, Touraine R, Thevenon J, Shinawi M,Beaver E, Heeley J, Hoover-Fong J, Durmaz CD, Karabulut HG, Marzioglu-Ozdemir E,Cayir A, Duz MB, Seven M, Price S, Ferreira BM, Vianna-Morgante AM, Ellard S,Parrish A, Stals K, Flores-Daboub J, Jhangiani SN, Gibbs RA; Baylor-HopkinsCenter for Mendelian Genomics; Brunner HG, Sutton VR, Lupski JR, Carvalho CMB.WNT Signaling Perturbations Underlie the Genetic Heterogeneity of RobinowSyndrome. Am J Hum Genet. 2018 Jan 4;102(1):27-43. doi:10.1016/j.ajhg.2017.10.002. Epub 2017 Dec 21. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/29276006)
- White JJ, Mazzeu JF, Hoischen A, Bayram Y, Withers M, Gezdirici A, Kimonis V, Steehouwer M, Jhangiani SN, Muzny DM, Gibbs RA; Baylor-Hopkins Center forMendelian Genomics; van Bon BWM, Sutton VR, Lupski JR, Brunner HG, Carvalho CMB.DVL3 Alleles Resulting in a -1 Frameshift of the Last Exon MediateAutosomal-Dominant Robinow Syndrome. Am J Hum Genet. 2016 Mar 3;98(3):553-561.doi: 10.1016/j.ajhg.2016.01.005. Epub 2016 Feb 25. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/26924530) or Free article on PubMed Central (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4800044/)

Genomic Location

The *DVL1* gene is found on chromosome 1 (https://medlineplus.gov/genetics/chromosome/1/).

Last updated February 1, 2018