DHCR24 gene

24-dehydrocholesterol reductase

Normal Function

The *DHCR24* gene provides instructions for making an enzyme called 24-dehydrocholesterol reductase. This enzyme is involved in multiple pathways that produce cholesterol. Cholesterol is a waxy, fat-like substance that can be obtained from foods that come from animals (particularly egg yolks, meat, poultry, fish, and dairy products). It can also be produced in various tissues in the body. For example, the brain cannot access the cholesterol that comes from food, so brain cells must produce their own. In one pathway, 24-dehydrocholesterol reductase is involved in the final step of cholesterol production (synthesis), converting the fat desmosterol into cholesterol. In a different pathway, 24-dehydrocholesterol reductase converts the fat lanosterol into another fat called 24,25-dihydrolanosterol. The end product of both of these pathways is cholesterol.

Cholesterol is necessary for normal embryonic development and has important functions both before and after birth. Cholesterol is an important component of cell membranes and the fatty protective covering that insulates nerves (myelin). Cholesterol also attaches (binds) to certain proteins to turn on (activate) the hedgehog signaling pathway, which is critical for normal development of many parts of the body before birth. Additionally, cholesterol plays a role in the production of certain hormones and digestive acids.

Health Conditions Related to Genetic Changes

Desmosterolosis

At least seven mutations in the *DHCR24* gene have been found to cause desmosterolosis. Desmosterolosis is a condition that is characterized by neurological problems, such as brain abnormalities and developmental delay, and can also include other signs and symptoms. The mutations that cause this condition change single protein building blocks (amino acids) in the 24-dehydrocholesterol reductase enzyme. As a result, enzyme activity is reduced and cholesterol production is decreased. Because the brain relies solely on cellular production for cholesterol, it is most severely affected. Without adequate cholesterol, cell membranes are not formed properly and nerve cells are not protected by myelin, leading to the death of these cells. In addition, a decrease in cholesterol production has more severe effects before birth than during

other periods of development because of the rapid increase in cell number that takes place. Disruption of normal cell formation before birth likely accounts for the additional developmental abnormalities of desmosterolosis.

Other Names for This Gene

- 3 beta-hydroxysterol delta 24-reductase
- 3-beta-hydroxysterol delta-24-reductase
- DCE
- delta(24)-sterol reductase
- delta(24)-sterol reductase precursor
- desmosterol-to-cholesterol enzyme
- diminuto/dwarf1 homolog
- KIAA0018
- Nbla03646
- seladin 1
- seladin-1
- SELADIN1
- selective AD indicator 1

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of DHCR24 (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=1718[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28%28DHCR24%5BTIAB%5D%29+OR+%2824-dehydrocholesterol+reductase%5BTIAB%5D%29+OR+%28seladin-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

- 24-DEHYDROCHOLESTEROL REDUCTASE; DHCR24 (https://omim.org/entry/606418)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/1718)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=DHCR24[gene])

References

- Dias C, Rupps R, Millar B, Choi K, Marra M, Demos M, Kratz LE, Boerkoel CF. Desmosterolosis: an illustration of diagnostic ambiguity of cholesterol synthesisdisorders. Orphanet J Rare Dis. 2014 Jun 25;9:94. doi: 10.1186/1750-1172-9-94. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/24961299) or Free article on PubMed Central (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4076431/)

- Waterham HR, Koster J, Romeijn GJ, Hennekam RC, Vreken P, Andersson HC, FitzPatrick DR, Kelley RI, Wanders RJ. Mutations in the 3beta-hydroxysterolDelta24-reductase gene cause desmosterolosis, an autosomal recessive disorder ofcholesterol biosynthesis. Am J Hum Genet. 2001 Oct;69(4):685-94. doi:10.1086/323473. Epub 2001 Aug 22. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/11519011) or Free article on PubMed Central (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1226055/)
- Zerenturk EJ, Sharpe LJ, Ikonen E, Brown AJ. Desmosterol and DHCR24: unexpected new directions for a terminal step in cholesterol synthesis. ProgLipid Res. 2013 Oct;52(4):666-80. doi: 10.1016/j.plipres.2013.09.002. Epub 2013Oct 2. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/24095826)

Genomic Location

The *DHCR24* gene is found on chromosome 1 (https://medlineplus.gov/genetics/chromosome/1/).

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