DCC gene

DCC netrin 1 receptor

Normal Function

The *DCC* gene provides instructions for making a protein called the netrin-1 receptor, which is involved in the development of the nervous system. This receptor has three major parts: an extracellular region that sticks out from the surface of the cell, a transmembrane region that anchors the receptor to the cell membrane, and an intracellular region that transmits signals to the interior of the cell. The extracellular region attaches (binds) to a substance (its ligand) called netrin-1, fitting together like a lock and its key. The binding of netrin-1 triggers signaling via the intracellular region of the receptor that helps direct the growth of specialized nerve cell extensions called axons. Axons transmit nerve impulses that signal muscle movement. Normally, movement signals from each half of the brain control muscles on the opposite side of the body. Binding of netrin-1 to its receptor inhibits axons from developing in ways that would carry movement signals from each half of the brain to the same side of the body.

The netrin-1 receptor is also thought to act as a dependence receptor, which means it has different functions in the presence or absence of its ligand. In the case of the netrin-1 receptor, binding to its ligand triggers signaling related to nervous system development, as described above. When not bound to netrin-1, the netrin-1 receptor acts as a tumor suppressor, which means that it keeps cells from growing and dividing too fast or in an uncontrolled way. Studies suggest that when the netrin-1 receptor is not bound to netrin-1, it triggers cell death (apoptosis).

Health Conditions Related to Genetic Changes

Congenital mirror movement disorder

At least 11 *DCC* gene mutations have been identified in people with congenital mirror movement disorder, a condition in which intentional movements of one side of the body are mirrored by involuntary movements of the other side. These mutations change single protein building blocks (amino acids) in the netrin-1 receptor or introduce a premature stop signal in the instructions for making the protein, resulting in an impaired or missing protein. Insufficient functional netrin-1 receptor protein impairs control of axon growth during nervous system development. As a result, movement signals from each half of the brain are abnormally transmitted to both sides of the body, leading to mirror movements.

Cancers

Deletions of genetic material that include the *DCC* gene have been found in more than 70 percent of colorectal cancers, as well as other cancerous tumors. This deletion is not inherited and is found only in the tumor cells. Deletion of the *DCC* gene results in the absence of the netrin-1 receptor. As a result, the netrin-1 receptor is not available to trigger apoptosis, resulting in the uncontrolled cell growth and division that leads to cancer.

Other Names for This Gene

- colorectal cancer suppressor
- colorectal tumor suppressor
- CRC18
- CRCR1
- DCC_HUMAN
- deleted in colorectal cancer protein
- deleted in colorectal carcinoma
- IGDCC1
- immunoglobulin superfamily DCC subclass member 1
- immunoglobulin superfamily, DCC subclass, member 1
- MRMV1
- netrin receptor DCC
- NTN1R1
- tumor suppressor protein DCC

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of DCC (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=1630[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28DCC%5BTIAB%5D%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

- COLORECTAL CANCER; CRC (https://omim.org/entry/114500)

- DCC NETRIN 1 RECEPTOR; DCC (https://omim.org/entry/120470)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/1630)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=DCC[gene])

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Genomic Location

The *DCC* gene is found on chromosome 18 (https://medlineplus.gov/genetics/chromosome/18/).

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