GALC gene

galactosylceramidase

Normal Function

The *GALC* gene provides instructions for making an enzyme called galactosylceramidase. Through a process called hydrolysis, this enzyme uses water molecules to break down certain fats called galactolipids, which are found primarily in the nervous system and kidneys.

Within cells, galactosylceramidase is found in enzyme-filled sacs called lysosomes where it hydrolyzes specific galactolipids, including galactosylceramide and psychosine. Galactosylceramide is an important component of myelin, the protective covering around certain nerve cells that ensures the rapid transmission of nerve impulses. Its breakdown by galactosylceramidase is part of the normal turnover of myelin that occurs throughout life. Psychosine, which is toxic to cells, forms during the production of myelin and is quickly broken down by galactosylceramidase. Under normal conditions, tissues contain very little psychosine.

Health Conditions Related to Genetic Changes

Krabbe disease

More than 200 *GALC* gene mutations that cause Krabbe disease have been identified. Krabbe disease is a brain disorder that usually begins in infancy (infantile Krabbe disease) and causes movement and eating problems, impaired development, and seizures. The most common mutation in affected individuals of European ancestry (often called 30-kb del) deletes a large segment of the *GALC* gene. Other mutations insert additional DNA building blocks (nucleotides) into the *GALC* gene, delete a small number of nucleotides from the gene, or replace single nucleotides with incorrect nucleotides.

These *GALC* gene mutations severely reduce or eliminate the activity of the galactosylceramidase enzyme. As a result, galactosylceramide and psychosine cannot be broken down. The accumulation of these galactolipids causes damage to myelin-forming cells, which impairs the formation of myelin and leads to the loss of myelin (demyelination) in the nervous system. Without myelin, nerves in the brain and other parts of the body cannot transmit signals properly, leading to the signs and symptoms of Krabbe disease.

Some individuals develop symptoms of Krabbe disease in childhood, adolescence, or adulthood (late-onset Krabbe disease). It is thought that these individuals have a mutation that allows some activity of the galactosylceramidase enzyme, which delays onset of the condition. The severity of the condition may also be affected by the presence of additional common variations (polymorphisms) in the *GALC* gene that affect the activity of the galactosylceramidase enzyme.

Other Names for This Gene

- galactocerebrosidase
- galactosylceramide beta-galactosidase
- GALC_HUMAN
- GALCERase

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of GALC (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=2581[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28%28GALC%5BTIAB%5D%29+OR+%28galactosylceramidase%5BTIAB%5D%29%29+OR+%28%28galactocerebrosidase%5BTIAB%5D%29+OR+%28Galactosylceramide+beta-Galactosidase%5BTIAB%5D%29+OR+%28GALCERase%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+2880+days%22%5Bdp%5D)

Catalog of Genes and Diseases from OMIM

- GALACTOSYLCERAMIDASE; GALC (https://omim.org/entry/606890)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/2581)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=GALC[gene])

References

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Genomic Location

The *GALC* gene is found on chromosome 14 (https://medlineplus.gov/genetics/chromosome/14/).

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