GALT Gene

1. Normal Function

The *GALT* gene provides instructions for making an enzyme called galactose-1-phosphate uridylyltransferase. This enzyme enables the body to process a simple sugar called galactose, which is present in small amounts in many foods. Galactose is primarily part of a larger sugar called lactose, which is found in all dairy products and many baby formulas.

Galactose-1-phosphate uridylyltransferase is responsible for one step in a chemical process that breaks down galactose into other molecules that can be used by the body. Specifically, this enzyme converts a modified form of galactose (galactose-1-phosphate) to glucose, which is another simple sugar. Glucose is the main energy source for most cells. This chemical reaction also produces another form of galactose (UDP-galactose) that is used to build galactose-containing proteins and fats. These modified proteins and fats play critical roles in chemical signaling, building cellular structures, transporting molecules, and producing energy.

2. Health Conditions Related to Genetic Changes

2.1 Galactosemia

More than 300 mutations in the *GALT* gene have been identified in people with the classic form of galactosemia, a condition that causes life-threatening signs and symptoms beginning shortly after birth. Most of these mutations severely reduce or eliminate the activity of galactose-1-phosphate uridylyltransferase. A shortage of this enzyme prevents cells from processing galactose obtained from the diet. As a result, galactose-1-phosphate and related compounds can build up to toxic levels in the body. The accumulation of these substances damages tissues and organs, leading to the serious medical problems associated with classic galactosemia.

Most changes in the *GALT* gene alter single protein building blocks (amino acids) in galactose-1-phosphate uridylyltransferase. The most common *GALT* mutation in white Europeans and North Americans replaces the amino acid glutamine with the amino acid arginine at position 188 in the enzyme (written as Gln188Arg or Q188R). Another mutation occurs almost exclusively in people of African descent. This genetic change substitutes the amino acid leucine for the amino acid serine at position 135 (written as Ser135Leu or S135L).

A particular *GALT* mutation called the Duarte variant results in a form of galactosemia with less serious complications than the classic type. This mutation replaces the amino acid asparagine with the amino acid aspartic acid at protein position 314 (written as Asn314Asp or N314D). The Duarte variant reduces but does not eliminate the activity of galactose-1-phosphate uridylyltransferase. The signs and symptoms associated with this variant tend to be milder because the enzyme retains 5 percent to 20 percent of its normal activity.

3. Other Names for This Gene

- Gal-1-P uridylyltransferase

- Galactosephosphate Uridylyltransferase

- GALT_HUMAN

- UDP Galactose Pyrophosphorylase

- UTP-Hexose-1-Phosphate Uridylyltransferase

- UTP:alpha-D-hexose-1-phosphate uridylyltransferase

References

1. Berry GT. Classic Galactosemia and Clinical Variant Galactosemia. 2000 Feb 4[updated 2020 Jul 2]. In: Adam MP, Ardinger HH, Pagon RA, Wallace SE, Bean LJH,Stephens K, Amemiya A, editors. GeneReviews® [Internet]. Seattle (WA): Universityof Washington, Seattle; 1993-2020. Available fromhttp://www.ncbi.nlm.nih.gov/books/NBK1518/

2. Bosch AM, Ijlst L, Oostheim W, Mulders J, Bakker HD, Wijburg FA, Wanders RJ,Waterham HR. Identification of novel mutations in classical galactosemia. HumMutat. 2005 May;25(5):502.

3. Coelho AI, Trabuco M, Ramos R, Silva MJ, Tavares de Almeida I, Leandro P,Rivera I, Vicente JB. Functional and structural impact of the most prevalentmissense mutations in classic galactosemia. Mol Genet Genomic Med. 2014Nov;2(6):484-96. doi: 10.1002/mgg3.94.

4. Fridovich-Keil JL, Gambello MJ, Singh RH, Sharer JD. Duarte VariantGalactosemia. 2014 Dec 4 [updated 2020 Jun 25]. In: Adam MP, Ardinger HH, PagonRA, Wallace SE, Bean LJH, Stephens K, Amemiya A, editors. GeneReviews®[Internet]. Seattle (WA): University of Washington, Seattle; 1993-2020. Availablefrom http://www.ncbi.nlm.nih.gov/books/NBK258640/

5. McCorvie TJ, Gleason TJ, Fridovich-Keil JL, Timson DJ. Misfolding of galactose1-phosphate uridylyltransferase can result in type I galactosemia. BiochimBiophys Acta. 2013 Aug;1832(8):1279-93. doi: 10.1016/j.bbadis.2013.04.004.

6. McCorvie TJ, Timson DJ. Structural and molecular biology of type Igalactosemia: disease-associated mutations. IUBMB Life. 2011 Nov;63(11):949-54.doi: 10.1002/iub.510.

7. McCorvie TJ, Timson DJ. The structural and molecular biology of type Igalactosemia: Enzymology of galactose 1-phosphate uridylyltransferase. IUBMBLife. 2011 Sep;63(9):694-700. doi: 10.1002/iub.511.

Retrieved from https://encyclopedia.pub/entry/history/show/12470