HLCS gene

holocarboxylase synthetase

Normal Function

The *HLCS* gene provides instructions for making an enzyme called holocarboxylase synthetase. This enzyme is important for the effective use of biotin, a B vitamin found in foods such as liver, egg yolks, and milk. In many of the body's tissues, holocarboxylase synthetase turns on (activates) enzymes called biotin-dependent carboxylases by attaching biotin to them. These carboxylases are involved in many critical cellular functions, including the production and breakdown of proteins, fats, and carbohydrates.

Holocarboxylase synthetase plays a role in regulating the activity (transcription) of genes. Transcription is the first step in the process of producing proteins. Specifically, the enzyme regulates genes that play a role in the transport and use of biotin in cells. Biotin is needed for the normal function of many tissues, including the brain, muscles, liver, and kidneys.

Health Conditions Related to Genetic Changes

Holocarboxylase synthetase deficiency

About 50 mutations in the *HLCS* gene have been identified in people with holocarboxylase synthetase deficiency, which is characterized by the body's inability to use biotin effectively. Affected infants often have difficulty feeding, breathing problems, a skin rash, hair loss (alopecia), and a lack of energy (lethargy). If left untreated, the disorder can lead to delayed development, seizures, and coma. These medical problems may be life-threatening in some cases.

Most of the *HLCS* gene mutations change a single protein building block (amino acid) in the holocarboxylase synthetase enzyme. Many of the known mutations occur in a region of the enzyme that binds to biotin. These genetic changes reduce the enzyme's ability to attach biotin to carboxylases. Without biotin, carboxylases remain inactive and are unable to process proteins, fats, and carbohydrates effectively. A lack of holocarboxylase synthetase activity may also alter the regulation of certain genes that are needed to transport and use biotin in cells. Researchers believe that these defects in enzyme function underlie the signs and symptoms of holocarboxylase synthetase deficiency.

Other Names for This Gene

- biotin apo-protein ligase
- biotin-protein ligase
- BPL1_HUMAN
- HCS
- holocarboxylase synthetase (biotin-(proprionyl-CoA-carboxylase (ATP-hydrolysing)) ligase)
- holocarboxylase synthetase (biotin-(proprionyl-Coenzyme A-carboxylase (ATP-hydrolysing)) ligase)

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of HLCS (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=3141[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28%28HLCS%5BTIAB%5D%29+OR+%28holocarboxylase+synthetase%5BTIAB%5D%29%29+OR+%28%28biotin+apo-protein+ligase%5BTIAB%5D%29+OR+%28holocarboxylase+synthetase%5BTIAB%5D%29+OR+%28Biotin-protein+ligase%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

- HOLOCARBOXYLASE SYNTHETASE; HLCS (https://omim.org/entry/609018)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/3141)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=HLCS[gene])

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Genomic Location

The *HLCS* gene is found on chromosome 21 (https://medlineplus.gov/genetics/chromosome/21/).

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