FECH gene

ferrochelatase

Normal Function

The *FECH* gene provides instructions for making an enzyme known as ferrochelatase. This enzyme is involved in the production of a molecule called heme. Heme is vital for all of the body's organs, although it is most abundant in the blood, bone marrow, and liver. Heme is an essential component of iron-containing proteins called hemoproteins, including hemoglobin (the protein that carries oxygen in the blood).

The production of heme is a multi-step process that requires eight different enzymes. Ferrochelatase is responsible for the eighth and final step in this process, in which an iron atom is inserted into the center of protoporphyrin IX (the product of the seventh step) to form heme.

Health Conditions Related to Genetic Changes

Porphyria

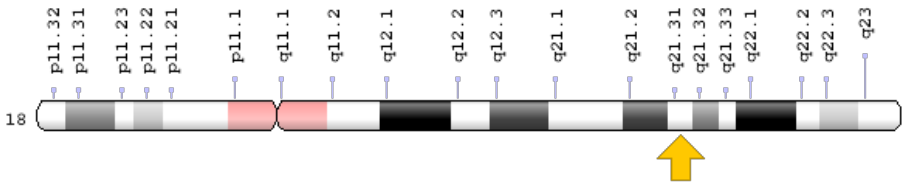
More than 110 mutations in the *FECH* gene have been identified in individuals with a form of porphyria called erythropoietic protoporphyria. A mutation in one copy of the *FECH* gene reduces each cell's production of ferrochelatase by about half. However, this is not enough to cause the signs and symptoms of porphyria; people with this disorder must also inherit a second altered copy of *FECH*. In some affected individuals, the second copy of the *FECH* gene is also nonfunctional, and cells make almost no ferrochelatase. In other affected individuals, the second copy of the *FECH* gene retains some of its function. This version of the gene is described as a low-expression allele. It reduces, but does not eliminate, the amount of ferrochelatase produced within cells. A combination of two mutated copies of the *FECH* gene in each cell, or one mutated copy of the gene and one low-expression allele, is necessary for erythropoietic protoporphyria to develop.

A shortage of functional ferrochelatase allows compounds called porphyrins to build up in developing red blood cells. These compounds are formed during the normal process of heme production, but reduced activity of ferrochelatase allows them to accumulate to toxic levels. The excess porphyrins can leak out of developing red blood cells and be transported through the bloodstream to the skin and other tissues. High levels of these compounds in the skin cause the oversensitivity to sunlight that is characteristic of this condition. Large amounts of porphyrins in the gallbladder can also cause gallstones. Less commonly, a buildup of these compounds in the liver can result in liver damage.

Chromosomal Location

Cytogenetic Location: 18q21.31, which is the long (q) arm of chromosome 18 at position 21.31

Molecular Location: base pairs 57,544,841 to 57,586,737 on chromosome 18 (Homo sapiens Annotation Release 109, GRCh38.p12) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- ferrochelatase (protoporphyria)
- Ferrochelatase, mitochondrial
- Heme Synthetase
- HEMH_HUMAN
- Porphyrin-Metal Chelatase
- Protoheme Ferro-Lyase

Additional Information & Resources

Educational Resources

- Biochemistry (fifth edition, 2002): Mammalian Porphyrins Are Synthesized from Glycine and Succinyl Coenzyme A
  https://www.ncbi.nlm.nih.gov/books/NBK22446/#A3395

Clinical Information from GeneReviews

- Erythropoietic Protoporphyria, Autosomal Recessive
  https://www.ncbi.nlm.nih.gov/books/NBK100826

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28FECH%5BTIAB%5D%29+OR+%28ferrochelatase%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+1800+days%22%5Bdp%5D

Catalog of Genes and Diseases from OMIM

- FERROCHELATASE
  http://omim.org/entry/612386

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
  http://atlasgeneticsoncology.org/Genes/GC_FECH.html
- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=FECH%5Bgene%5D
- HGNC Gene Symbol Report
  https://www.genenames.org/data/gene-symbol-report/#!/hgnc_id/HGNC:3647
- Monarch Initiative
  https://monarchinitiative.org/gene/NCBIGene:2235
- NCBI Gene
  https://www.ncbi.nlm.nih.gov/gene/2235
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