PPOX gene
protoporphyrinogen oxidase

Normal Function
The PPOX gene provides instructions for making an enzyme known as protoporphyrinogen oxidase. 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. Protoporphyrinogen oxidase is responsible for the seventh step in this process, in which two hydrogen atoms are removed from protoporphyrinogen IX (the product of the sixth step) to form protoporphyrin IX. In the final step, another enzyme modifies protoporphyrin IX by inserting an iron atom to produce heme.

Health Conditions Related to Genetic Changes

Porphyria
More than 130 mutations in the PPOX gene have been identified in people with a form of porphyria called variegate porphyria. A particular PPOX gene mutation is found in about 95 percent of South African families with this form of the disorder. The mutation changes a single protein building block (amino acid) in protoporphyrinogen oxidase, replacing the amino acid arginine with the amino acid tryptophan at position 59 (written as Arg59Trp or R59W).

Mutations in the PPOX gene reduce the activity of protoporphyrinogen oxidase, allowing compounds called porphyrin precursors to build up in the body. These compounds are formed during the normal process of heme production, but reduced activity of protoporphyrinogen oxidase allows them to accumulate to toxic levels. Nongenetic factors such as certain drugs, alcohol, dieting, as well as other genetic factors that have not been identified, also contribute to the characteristic features of variegate porphyria.
Chromosomal Location

Cytogenetic Location: 1q23.3, which is the long (q) arm of chromosome 1 at position 23.3

Molecular Location: base pairs 161,165,824 to 161,178,277 on chromosome 1 (Homo sapiens Updated Annotation Release 109.20200228, GRCh38.p13) (NCBI)

Other Names for This Gene

• PPO
• PPOX_HUMAN
• protoporphyrinogen dehydrogenase
• protoporphyrinogen IX oxidase
• protoporphyrinogenase
• protox

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

• Variegate Porphyria
  https://www.ncbi.nlm.nih.gov/books/NBK121283
Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28PPOX%5BTIAB%5D+%29+OR+%28protoporphyrinogen+oxidase%5BTIAB%5D%29%29+AND+%28%28Genes%5BMH%5D+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

- PROTOPORPHIROGEN OXIDASE
  http://omim.org/entry/600923

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
  http://atlasgeneticsoncology.org/Genes/GC_PPOX.html
- ClinVar
- HGNC Gene Symbol Report
- Monarch Initiative
  https://monarchinitiative.org/gene/NCBIGene:5498
- NCBI Gene
- UniProt
  https://www.uniprot.org/uniprot/P50336

Sources for This Summary

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/15868463
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/9554235
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/15652607
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/12922165

page 3
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/14535846
  Free article on PubMed Central: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1223874/

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/10692079

  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/15660919

Reprinted from Genetics Home Reference:

Reviewed: July 2009
Published: March 17, 2020

Lister Hill National Center for Biomedical Communications
U.S. National Library of Medicine
National Institutes of Health
Department of Health & Human Services