PDP1 gene

pyruvate dehydrogenase phosphatase catalytic subunit 1

Normal Function

The *PDP1* gene provides instructions for making a protein called pyruvate dehydrogenase phosphatase 1, which is part of a large group of proteins called the pyruvate dehydrogenase complex. The pyruvate dehydrogenase phosphatase 1 protein turns on (activates) the complex by removing a phosphate group (a cluster of oxygen and phosphorus atoms) from the complex.

The pyruvate dehydrogenase complex plays an important role in the pathways that convert the energy from food into a form that cells can use. This enzyme converts a molecule called pyruvate, which is formed from the breakdown of carbohydrates, into another molecule called acetyl-CoA. This conversion is essential to begin the series of chemical reactions that produces adenosine triphosphate (ATP), the cell's main energy source.

Health Conditions Related to Genetic Changes

Pyruvate dehydrogenase deficiency

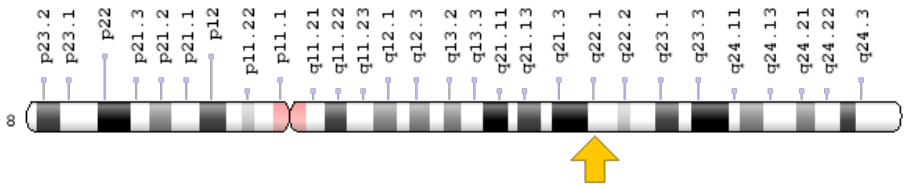
At least one mutation in the *PDP1* gene has been identified in individuals with pyruvate dehydrogenase deficiency; mutation of the *PDP1* gene is a very rare cause of this condition. Pyruvate dehydrogenase deficiency is characterized by a potentially life-threatening buildup of a chemical called lactic acid in the body (lactic acidosis), delayed development, and neurological problems.

The identified mutation removes one protein building block (amino acid) of the pyruvate dehydrogenase phosphatase 1 protein, which is thought to change its shape. The abnormal protein cannot remove the phosphate group from the pyruvate dehydrogenase complex, which reduces the activity of the complex. With decreased activity of this complex, pyruvate builds up and is converted, in another chemical reaction, to lactic acid, causing lactic acidosis. In addition, the production of cellular energy is diminished. The brain, which is especially dependent on this form of energy, is severely affected, resulting in the neurological problems associated with pyruvate dehydrogenase deficiency.

Chromosomal Location

Cytogenetic Location: 8q22.1, which is the long (q) arm of chromosome 8 at position 22.1

Molecular Location: base pairs 93,916,923 to 93,926,068 on chromosome 8 (Homo sapiens Updated Annotation Release 109.20190905, GRCh38.p13) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- PDH
- PDP
- PDP 1
- PDP1_HUMAN
- PDPC
- PDPC 1
- PPM2C
- protein phosphatase 2C, magnesium-dependent, catalytic subunit
- pyruvate dehydrogenase (Lipoamide) phosphatase-phosphatase
- pyruvate dehydrogenase [acetyl-transferring]]-phosphatase 1, mitochondrial
- pyruvate dehyrogenase phosphatase catalytic subunit 1

Additional Information & Resources

Educational Resources

- Biochemistry (fifth edition, 2002): The Formation of Acetyl Coenzyme A from Pyruvate
  https://www.ncbi.nlm.nih.gov/books/NBK22427/#A2376
- Biochemistry (fifth edition, 2002): The Pyruvate Dehydrogenase Complex Is Regulated Allosterically and by Reversible Phosphorylation
  https://www.ncbi.nlm.nih.gov/books/NBK22347/#A2410

- Molecular Biology of the Cell (fourth edition, 2002): Sugars and Fats Are Both Degraded to Acetyl CoA in Mitochondria
  https://www.ncbi.nlm.nih.gov/books/NBK26882/#A300
- Molecular Cell Biology (fourth edition, 2000): Mitochondrial Oxidation of Pyruvate Begins with the Formation of Acetyl CoA
  https://www.ncbi.nlm.nih.gov/books/NBK21624/#A4352

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28PDP1%5BTIAB%5D%29+OR+%28PDP+1%5BTIAB%5D%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

- PYRUVATE DEHYDROGENASE PHOSPHATASE CATALYTIC SUBUNIT 1
  http://omim.org/entry/605993

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
  http://atlasgeneticsoncology.org/Genes/GC_PDP1.html
- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=PDP1%5Bgene%5D
- HGNC Gene Symbol Report
  https://www.genenames.org/data/gene-symbol-report/#!/hgnc_id/HGNC:9279
- Monarch Initiative
  https://monarchinitiative.org/gene/NCBIGene:54704
- NCBI Gene
  https://www.ncbi.nlm.nih.gov/gene/54704
- UniProt
  https://www.uniprot.org/uniprot/Q9P0J1

Sources for This Summary

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  https://www.ncbi.nlm.nih.gov/books/NBK22427/#A2376
- Cameron JM, Maj M, Levandovskiy V, Barnett CP, Blaser S, Mackay N, Raiman J, Feigenbaum A, Schulze A, Robinson BH. Pyruvate dehydrogenase phosphatase 1 (PDP1) null mutation produces a lethal infantile phenotype. Hum Genet. 2009 Apr;125(3):319-26. doi: 10.1007/s00439-009-0629-6. Epub 2009 Jan 30.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/19184109

- Maj MC, MacKay N, Levandovskiy V, Addis J, Baumgartner ER, Baumgartner MR, Robinson BH, Cameron JM. Pyruvate dehydrogenase phosphatase deficiency: identification of the first mutation in two brothers and restoration of activity by protein complementation. J Clin Endocrinol Metab. 2005 Jul;90(7):4101-7. Epub 2005 Apr 26.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/15855260
- OMIM: PYRUVATE DEHYDROGENASE PHOSPHATASE CATALYTIC SUBUNIT 1
  http://omim.org/entry/605993
- Roche TE, Hiromasa Y, Turkan A, Gong X, Peng T, Yan X, Kasten SA, Bao H, Dong J. Essential roles of lipoyl domains in the activated function and control of pyruvate dehydrogenase kinases and phosphatase isoform 1. Eur J Biochem. 2003 Mar;270(6):1050-6. Review.
  Citation on PubMed: https://www.ncbi.nlm.nih.gov/pubmed/12631265

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