PNP gene

purine nucleoside phosphorylase

Normal Function

The *PNP* gene provides instructions for making an enzyme called purine nucleoside phosphorylase. This enzyme is found throughout the body but is most active in certain white blood cells called lymphocytes. These cells protect the body against potentially harmful invaders, such as bacteria or viruses. Lymphocytes are produced in specialized lymphoid tissues including the thymus and lymph nodes, and then released into the blood. The thymus is a gland located behind the breastbone; lymph nodes are found throughout the body. Lymphocytes in the blood and in lymphoid tissues are a major component of the immune system.

Purine nucleoside phosphorylase is known as a housekeeping enzyme because it clears away waste molecules called deoxyinosine and deoxyguanosine, which are generated when DNA is broken down. Specifically, purine nucleoside phosphorylase converts deoxyinosine to another molecule called hypoxanthine, and converts deoxyguanosine to another molecule called guanine.

Health Conditions Related to Genetic Changes

Purine nucleoside phosphorylase deficiency

More than 35 *PNP* gene mutations have been identified in individuals with purine nucleoside phosphorylase deficiency, which is an immune system disorder in which the body is unable to fight foreign invaders such as bacteria and viruses. Affected individuals have repeated infections that can be life-threatening. Some people with purine nucleoside phosphorylase deficiency also have neurological problems, such as intellectual disability or difficulty coordinating movements (ataxia).

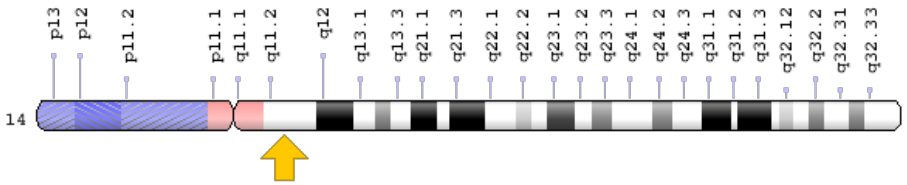
Most of the *PNP* gene mutations change single protein building blocks (amino acids) in the purine nucleoside phosphorylase enzyme. The mutations reduce or eliminate the activity of purine nucleoside phosphorylase. The resulting excess of waste molecules and further reactions involving them lead to the buildup of a substance called deoxyguanosine triphosphate (dGTP) to levels that are toxic to lymphocytes.

A type of lymphocytes known as T cells are particularly vulnerable to a toxic buildup of dGTP, particularly immature T cells in the thymus. The dGTP damages these cells and triggers their self-destruction (apoptosis). Lymphocytes in other lymphoid tissues can also be damaged. The shortage of lymphocytes results in the immune problems that cause vulnerability to severe infections. Damage to brain cells caused by buildup of dGTP is thought to underlie the neurological problems that occur in some people with purine nucleoside phosphorylase deficiency.

Chromosomal Location

Cytogenetic Location: 14q11.2, which is the long (q) arm of chromosome 14 at position 11.2

Molecular Location: base pairs 20,469,379 to 20,478,006 on chromosome 14 (Homo sapiens Updated Annotation Release 109.20190905, GRCh38.p13) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- inosine phosphorylase
- NP
- PNPH_HUMAN
- PRO1837
- PUNP
- purine-nucleoside:orthophosphate ribosyltransferase

Additional Information & Resources

Educational Resources

- Immunobiology (fifth edition, 2001): Defects in T-Cell Function Result in Severe Combined Immunodeficiencies
  https://www.ncbi.nlm.nih.gov/books/NBK27109/#A1509

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28purine+nucleoside+phosphorylase%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+1440+days%22%5Bdp%5D

Catalog of Genes and Diseases from OMIM

- PURINE NUCLEOSIDE PHOSPHORYLASE
  http://omim.org/entry/164050

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
  http://atlasgeneticsoncology.org/Genes/PNPID46893ch14q11.html
- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=PNP%5Bgene%5D
- HGNC Gene Symbol Report
  https://www.genenames.org/data/gene-symbol-report/#!/hgnc_id/HGNC:7892
- Monarch Initiative
  https://monarchinitiative.org/gene/NCBIGene:4860
- NCBI Gene
  https://www.ncbi.nlm.nih.gov/gene/4860
- UniProt
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