What is the official name of the PAH gene?

The official name of this gene is “phenylalanine hydroxylase.”

PAH is the gene's official symbol. The PAH gene is also known by other names, listed below.

What is the normal function of the PAH gene?

The PAH gene provides instructions for making an enzyme called phenylalanine hydroxylase. This enzyme is responsible for the first step in processing phenylalanine, which is a building block of proteins (an amino acid) obtained through the diet. Phenylalanine is found in all proteins and in some artificial sweeteners.

Phenylalanine hydroxylase is responsible for the conversion of phenylalanine to another amino acid, tyrosine. The enzyme works with a molecule called tetrahydrobiopterin (BH4) to carry out this chemical reaction. Tyrosine is used to make several types of hormones, certain chemicals that transmit signals in the brain (neurotransmitters), and a pigment called melanin, which gives hair and skin their color. Tyrosine can also be broken down into smaller molecules that are used to produce energy.

How are changes in the PAH gene related to health conditions?

phenylketonuria - caused by mutations in the PAH gene

More than 500 mutations in the PAH gene have been identified in people with phenylketonuria (PKU). Most of these mutations change single amino acids in phenylalanine hydroxylase. For example, the most common mutation in many populations replaces the amino acid arginine with the amino acid tryptophan at position 408 (written as Arg408Trp or R408W). Other PAH mutations delete small amounts of DNA from the gene or disrupt the way the gene's instructions are used to make phenylalanine hydroxylase.

PAH mutations reduce the activity of phenylalanine hydroxylase, preventing it from processing phenylalanine effectively. As a result, this amino acid can build up to toxic levels in the blood and other tissues. Because nerve cells in the brain are particularly
sensitive to phenylalanine levels, excessive amounts of this substance can cause brain damage.

Classic PKU, the most severe form of the disorder, occurs when phenylalanine hydroxylase activity is severely reduced or absent. People with untreated classic PKU have levels of phenylalanine high enough to cause severe brain damage and other serious medical problems. Mutations in the PAH gene that allow the enzyme to retain some activity result in milder versions of this condition, such as variant PKU or non-PKU hyperphenylalaninemia.

Where is the PAH gene located?

Cytogenetic Location: 12q22-q24.2

Molecular Location on chromosome 12: base pairs 102,838,320 to 102,917,602

The PAH gene is located on the long (q) arm of chromosome 12 between positions 22 and 24.2.

More precisely, the PAH gene is located from base pair 102,838,320 to base pair 102,917,602 on chromosome 12.


Where can I find additional information about PAH?

You and your healthcare professional may find the following resources about PAH helpful.

- Educational resources - Information pages
  
  
• Genetic Testing Registry - Repository of genetic test information
  o GTR: Genetic tests for PAH (http://www.ncbi.nlm.nih.gov/gtr/tests/?term=5053%5Bgeneid%5D)

You may also be interested in these resources, which are designed for genetics professionals and researchers.

• PubMed - Recent literature (http://www.ncbi.nlm.nih.gov/pubmed?term=%28%28PAH%5BTI%5D%29%20OR%20%28phenylalanine%20hydroxylase%20OR%20phenylalanine%20OR%20phenylalanine%204-hydroxylase%20OR%20phenylalanine%204-monooxygenase%29%20%20AND%20english%20AND%20human%22last%201800%22%5Bdp%5D)

• OMIM - Genetic disorder catalog (http://omim.org/entry/612349)

• Research Resources - Tools for researchers
  o PAHdb Phenylalanine Hydroxylase Locus Knowledgebase (http://www.pahdb.mcgill.ca/)

What other names do people use for the PAH gene or gene products?

• L-Phenylalanine,tetrahydrobiopterin:oxygen oxidoreductase (4-hydroxylating)
• PH4H_HUMAN
• Phenylalaninase
• Phenylalanine 4-Hydroxylase
• Phenylalanine 4-Monooxygenase
• PKU1


What glossary definitions help with understanding PAH?

acids ; amino acid ; arginine ; cofactor ; DNA ; enzyme ; gene ; L-phenylalanine ; melanin ; molecule ; mutation ; neurotransmitters ; oxidoreductase ; oxygen ; phenylalanine ; pigment ; toxic ; tryptophan ; tyrosine

You may find definitions for these and many other terms in the Genetics Home Reference Glossary.

References


The resources on this site should not be used as a substitute for professional medical care or advice. Users seeking information about a personal genetic disease, syndrome, or condition should consult with a qualified healthcare professional. See How can I find a genetics professional in my area? (http://ghr.nlm.nih.gov/handbook/consult/findingprofessional) in the Handbook.

Reviewed: January 2008
Published: July 19, 2015