CYP7B1 gene

cytochrome P450 family 7 subfamily B member 1

Normal Function

The *CYP7B1* gene is a member of the cytochrome P450 gene family. Enzymes produced from cytochrome P450 genes are involved in the formation and breakdown of various molecules and chemicals within cells. The *CYP7B1* gene provides instructions for making an enzyme called oxysterol 7-alpha-hydroxylase. This enzyme is produced primarily in the liver and the brain. In the liver, oxysterol 7-alpha-hydroxylase is involved in the pathway that breaks down a waxy, fat-like substance called cholesterol to form a bile acid called chenodeoxycholic acid. Bile acids are a component of a digestive fluid called bile that digests fats.

In the brain, oxysterol 7-alpha-hydroxylase is also involved in a pathway that converts cholesterol to hormones called neurosteroids. Neurosteroids increase nerve cell activity (excitability) and promote cell survival and communication between nerve cells. The enzyme primarily converts the neurosteroid dehydroepiandrosterone (DHEA) into 7-hydroxy-DHEA. Oxysterol 7-alpha-hydroxylase helps maintain normal cholesterol levels in the brain and, by producing neurosteroids through altering existing hormones within the pathway, regulates the effects of neurosteroids on the brain.

Health Conditions Related to Genetic Changes

Spastic paraplegia type 5A

At least 37 mutations in the *CYP7B1* gene have been found to cause spastic paraplegia type 5A. This condition is characterized by muscle stiffness (spasticity) and severe weakness of the lower limbs (paraplegia), typically beginning in adolescence. Most *CYP7B1* gene mutations change single protein building blocks (amino acids) in the oxysterol 7-alpha-hydroxylase enzyme. Such changes reduce the enzyme's activity. Other mutations result in a complete loss of functional enzyme.

Reduced oxysterol 7-alpha-hydroxylase enzyme activity does not seem to affect cholesterol breakdown or bile acid production in the liver. Another pathway in the liver can perform these functions, which may explain why reduction of oxysterol 7-alpha-hydroxylase activity does not impact liver function.

In the brain, a decrease in enzyme activity results in an accumulation of cholesterol and

alters neurosteroid production triggered by oxysterol 7-alpha-hydroxylase. Abnormal levels of neurosteroids impairs cell survival, likely leading to nerve cell death. The abnormal buildup of cholesterol in the brain probably also contributes to the death of nerve cells. The loss of these cells results in the deterioration of nervous system functions (neurodegeneration) and causes the movement problems, weakness, and other signs and symptoms characteristic of spastic paraplegia type 5A.

Other Names for This Gene

- CBAS3
- CP7B
- cytochrome P450 7B1
- cytochrome P450, subfamily VIIB (oxysterol 7 alpha-hydroxylase), polypeptide 1
- oxysterol 7-alpha-hydroxylase

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of CYP7B1 (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=9420[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28%28CYP7B1%5BTIAB%5D%29+OR+%28oxysterol+7-alpha-hydroxylase%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+3600+days%22%5Bdp%5D)

Catalog of Genes and Diseases from OMIM

- CYTOCHROME P450, FAMILY 7, SUBFAMILY B, POLYPEPTIDE 1; CYP7B1 (https://omim.org/entry/603711)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/9420)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=CYP7B1[gene])

References

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Toscano A, Scarlato M, Fantin M, Bresolin N, Bassi MT. Clinical phenotypevariability in patients with hereditary spastic paraplegia type 5 associated withCYP7B1 mutations. Clin Genet. 2012 Feb;81(2):150-7. doi:10.1111/j.1399-0004.2011.01624.x. Epub 2011 Jan 31. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/21214876)

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Genomic Location

The *CYP7B1* gene is found on chromosome 8 (https://medlineplus.gov/genetics/chromosome/8/).

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