Phosphoserine Aminotransferase 1

Alternative Names
PSAT1
PSAT
Endometrial Progesterone-Induced Protein
EPIP

Record Category
Gene locus

WHO-ICD
N/A to gene loci

Incidence per 100,000 Live Births
N/A to gene loci

OMIM Number
610936

Mode of Inheritance
N/A to gene loci

Gene Map Locus
9q21.2

Description
The PSAT1 gene encodes an enzyme that is involved in the synthesis of the L-serine amino acid. The phosphoserine aminotransferase enzyme catalyzes the second step in the 3-step serine biosynthesis pathway, the conversion of 3-phosphohydroxypyruvate into 3-phosphoserine. As an amino acid, serine is required for protein synthesis. It is also a precursor to compounds such as sphingomyelin and cysteine and neuromodulators such as glycine. Hence, any defects in the serine biosynthesis pathway can have strong pathological consequences.

Mutations in PSAT1 result in Neu-Laxova syndrome 2 (NLS2), a severe fatal disorder characterized by ichthyosis, microcephaly, intra-uterine growth retardation, nervous system abnormalities, limb deformities, edema, and facial dysmorphia. The gene is also associated with Phosphoserine Aminotransferase Deficiency (PSATD), a less severe phenotype characterized by congenital microcephaly, hypertonia, psychomotor retardation, and seizures.

Molecular Genetics
The PSAT1 gene is located on the long arm of chromosome 9. It is made up of 33 kb of DNA and its coding sequence spans nine exons. The gene encodes a 40 kDa protein that is made up of 370 amino acids. Alternative splicing results in a second isoform with 324 amino acids. The gene is found to be highly expressed in the brain, liver, kidney, and pancreas.

While compound heterozygous mutations in the gene have been associated with PSATD, both homozygous and compound heterozygous mutations, including transitions, transversions, insertions, deletions and frameshifts, have been associated with NLS2.

Epidemiology in the Arab World

Egypt
El-Hattab et al. (2016) analyzed a 9-day-old male neonate born to healthy consanguineous Egyptian parents. The child was born at full term with microcephaly, intra-uterine growth retardation, ichthyotic skin, joint contractures, bilateral club feet, hypertonia, and facial dysmorphia. The child developed seizures and eventually succumbed to an unknown cause at the age of 9-weeks. Autozygome analysis identified PSAT1 as a candidate gene. Sanger sequencing was carried out to uncover a homozygous c.296C>T mutation that resulted in a p.Ala99Val substitution.

References
El-Hattab AW, Shaheen R, Hertecant J, Galadari HI, Albaqawi BS, Nabil A, Alkuraya FS. On the phenotypic spectrum of serine biosynthesis defects. J Inherit Metab Dis. 2016; 39(3):373-81. PMID: 26960553.

Related CTGA Records
Neu-Laxova Syndrome 2

External Links

https://www.genecards.org/cgi-bin/carddisp.pl?gene=PSAT1
https://www.ncbi.nlm.nih.gov/gene/29968

Contributors
Sayeeda Hana: 26.10.2016