SEPSECS gene

Sep (O-phosphoserine) tRNA:Sec (selenocysteine) tRNA synthase

Normal Function

The *SEPSECS* gene provides instructions for making an enzyme known as SepSecS. This enzyme is involved in the formation of a molecule called a transfer RNA (tRNA), which is a chemical cousin of DNA that is needed for building proteins. This particular tRNA plays a critical role in the production of a protein building block (amino acid) called selenocysteine (Sec). Selenocysteine contains the chemical element selenium, which is an essential nutrient obtained from the diet.

Proteins that contain selenocysteine are called selenoproteins. Researchers have identified about 25 human selenoproteins with diverse functions. For example, these proteins are involved in antioxidant reactions, which protect cells against compounds called reactive oxygen species that can damage DNA, proteins, and cell membranes. Selenoproteins also play a role in turning on (activating) thyroid hormones and are involved in immune system function and the production of sperm cells. Additionally, studies suggest that selenoproteins are critical for normal brain development and for the function of nerve cells (neurons).

Health Conditions Related to Genetic Changes

Pontocerebellar hypoplasia

At least three mutations in the *SEPSECS* gene have been identified in people with a disorder of brain development called pontocerebellar hypoplasia. The major features of this condition include delayed development, problems with movement, and intellectual disability. *SEPSECS* gene mutations have been found to cause a form of the disorder designated pontocerebellar hypoplasia type 2 (PCH2) in several families of Iraqi and Moroccan ancestry. When PCH2 results from mutations in the *SEPSECS* gene, it is sometimes categorized more specifically as PCH2D. The signs and symptoms of PCH2D appear to be somewhat less severe than other forms of pontocerebellar hypoplasia. Researchers also refer to PCH2D as progressive cerebellocerebral atrophy (PCCA).

The *SEPSECS* gene mutations that cause PCH2D completely eliminate the function of SepSecS. A lack of this enzyme's function impairs the production of selenocysteine and the subsequent formation of selenoproteins. It is unclear how a shortage of these

proteins contributes to abnormal brain development in people with PCH2D.

Other Names for This Gene

- liver-pancreas antigen
- LP
- O-phosphoseryl-tRNA(Sec) selenium transferase
- PCH2D
- SLA
- SLA-p35
- SLA/LP
- SLA/LP autoantigen
- soluble liver antigen
- soluble liver antigen/liver pancreas antigen
- tRNA(Ser/Sec)-associated antigenic protein
- UGA suppressor tRNA-associated protein

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of SEPSECS (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=51091[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28SEPSECS%5BTIAB%5D%29+OR+%28SLA-p35%5BTIAB%5D%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+3600+days%22%5Bdp%5D)

Catalog of Genes and Diseases from OMIM

- O-PHOSPHOSERINE tRNA-SELENOCYSTEINE tRNA SYNTHASE; SEPSECS (https://omim.org/entry/613009)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/51091)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=SEPSECS[gene])

References

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- Brown KM, Arthur JR. Selenium, selenoproteins and human health: a review.Public Health Nutr. 2001 Apr;4(2B):593-9. doi: 10.1079/phn2001143. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/11683552)
- Palioura S, Sherrer RL, Steitz TA, Soll D, Simonovic M. The humanSepSecS-tRNASec complex reveals the mechanism of selenocysteine formation.Science. 2009 Jul 17;325(5938):321-5. doi: 10.1126/science.1173755. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/19608919) or Free article on PubMed Central (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2857584/)

Genomic Location

The *SEPSECS* gene is found on chromosome 4 (https://medlineplus.gov/genetics/chromosome/4/).

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