



DARS2 gene

aspartyl-tRNA synthetase 2, mitochondrial

Normal Function

The *DARS2* gene provides instructions for making an enzyme called mitochondrial aspartyl-tRNA synthetase. This enzyme is important in the production (synthesis) of proteins in cellular structures called mitochondria, the energy-producing centers in cells. While most protein synthesis occurs in the fluid surrounding the nucleus (cytoplasm), some proteins are synthesized in the mitochondria.

During protein synthesis, in either the mitochondria or the cytoplasm, a type of RNA called transfer RNA (tRNA) helps assemble protein building blocks (amino acids) into a chain that forms the protein. Each tRNA carries a specific amino acid to the growing chain. Enzymes called aminoacyl-tRNA synthetases, including mitochondrial aspartyl-tRNA synthetase, attach a particular amino acid to a specific tRNA. Mitochondrial aspartyl-tRNA synthetase attaches the amino acid aspartic acid to the correct tRNA, which helps ensure that aspartic acid is added at the proper place in the mitochondrial protein.

Health Conditions Related to Genetic Changes

Leukoencephalopathy with brainstem and spinal cord involvement and lactate elevation

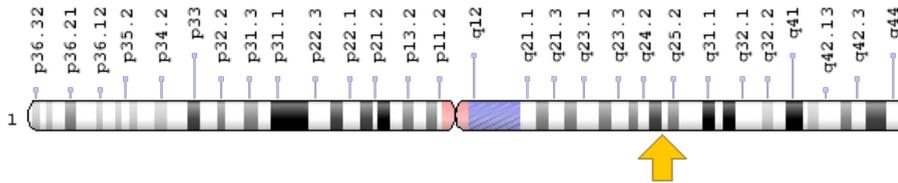
At least 25 mutations in the *DARS2* gene have been identified in people with leukoencephalopathy with brainstem and spinal cord involvement and lactate elevation (LBSL), a condition that affects the brain and spinal cord and causes difficulty walking. The most common mutation that causes this condition disrupts the way genetic information is pieced together to make a blueprint for producing the mitochondrial aspartyl-tRNA synthetase enzyme. Most copies of the blueprint are pieced together incorrectly, which prevents the enzyme from being produced. However, some copies are pieced together correctly, and a small amount of normal enzyme is made. Other mutations change single amino acids in the enzyme. This type of mutation results in decreased mitochondrial aspartyl-tRNA synthetase enzyme activity. With reduced activity, the enzyme has difficulty adding aspartic acid to the tRNA, which hinders the addition of this amino acid to mitochondrial proteins.

It is unclear how the gene mutations lead to the signs and symptoms of LBSL. Researchers do not understand why reduced activity of mitochondrial aspartyl-tRNA synthetase specifically affects certain parts of the brain and spinal cord.

Chromosomal Location

Cytogenetic Location: 1q25.1, which is the long (q) arm of chromosome 1 at position 25.1

Molecular Location: base pairs 173,824,673 to 173,858,546 on chromosome 1 (Homo sapiens Updated Annotation Release 109.20190607, GRCh38.p13) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- aspartate tRNA ligase 2, mitochondrial
- aspartyl-tRNA synthetase, mitochondrial
- aspartyl-tRNA synthetase, mitochondrial precursor
- ASPRS
- FLJ10514
- LBSL
- MT-ASPRS

Additional Information & Resources

Educational Resources

- Genomes (2nd Edition, 2002): Aminoacyl-tRNA Synthetases Attach Amino Acids to tRNAs
<https://www.ncbi.nlm.nih.gov/books/NBK21111/#A7614>

Clinical Information from GeneReviews

- Leukoencephalopathy with Brain Stem and Spinal Cord Involvement and Lactate Elevation
<https://www.ncbi.nlm.nih.gov/books/NBK43417>

Scientific Articles on PubMed

- PubMed
<https://www.ncbi.nlm.nih.gov/pubmed?term=%28DARS2%5BTIAB%5D%29+OR+%28%28ASPRS%5BTIAB%5D%29+OR+%28LBSL%5BTIAB%5D%29+OR+%28MT-ASPRS%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

- ASPARTYL-tRNA SYNTHETASE 2
<http://omim.org/entry/610956>

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
http://atlasgeneticsoncology.org/Genes/GC_DARS2.html
- ClinVar
<https://www.ncbi.nlm.nih.gov/clinvar?term=DARS2%5Bgene%5D>
- HGNC Gene Symbol Report
https://www.genenames.org/data/gene-symbol-report/#!/hgnc_id/HGNC:25538
- Monarch Initiative
<https://monarchinitiative.org/gene/NCBIGene:55157>
- NCBI Gene
<https://www.ncbi.nlm.nih.gov/gene/55157>
- UniProt
<https://www.uniprot.org/uniprot/Q6PI48>

Sources for This Summary

- OMIM: ASPARTYL-tRNA SYNTHETASE 2
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