ADSL gene

adenylosuccinate lyase

Normal Function

The *ADSL* gene provides instructions for making an enzyme called adenylosuccinate lyase. This enzyme performs two steps in the process that produces (synthesizes) purine nucleotides. These nucleotides are building blocks of DNA, its chemical cousin RNA, and molecules such as ATP that serve as energy sources in the cell. Adenylosuccinate lyase and other enzymes involved in purine synthesis form a group of proteins (a protein complex) called the purinosome. This complex comes together when there is a shortage of purines or when a large amount of purines is needed, such as during cell division. As part of this complex, adenylosuccinate lyase converts a molecule called succinylaminoimidazole carboxamide ribotide (SAICAR) to aminoimidazole carboxamide ribotide (AICAR) and converts succinyladenosine monophosphate (SAMP) to adenosine monophosphate (AMP).

Health Conditions Related to Genetic Changes

Adenylosuccinate lyase deficiency

More than 50 mutations in the *ADSL* gene have been found to cause adenylosuccinate lyase deficiency. This condition causes brain dysfunction (encephalopathy) that leads to delayed development of mental and motor skills (psychomotor delay), autistic behaviors that affect communication and social interaction, and seizures. Most of the mutations involved in this condition change single protein building blocks (amino acids) in the adenylosuccinate lyase enzyme. The altered enzymes have two to 20 percent of normal function, and studies suggest they are less able to form stable purinosomes.

A reduction of adenylosuccinate lyase function, possibly due to a shortage of purinosomes, leads to buildup of SAICAR and SAMP. These substances are converted through a different reaction to succinylaminoimidazole carboxamide riboside (SAICAr) and succinyladenosine (S-Ado). Detection of these substances in body fluids can help with diagnosis of adenylosuccinate lyase deficiency. Researchers believe that SAICAr and S-Ado are toxic; damage to brain tissue caused by one or both of these substances likely underlies the neurological problems that occur in adenylosuccinate lyase deficiency.

Studies suggest that the amount of SAICAr relative to S-Ado reflects the severity of

adenylosuccinate lyase deficiency. Individuals with more SAICAr than S-Ado have more severe encephalopathy and psychomotor delay.

Other Names for This Gene

- adenylosuccinase
- adenylosuccinate lyase isoform a
- adenylosuccinate lyase isoform b
- AMPS
- ASASE
- ASL

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of ADSL (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=158[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28%28ADSL%5BTIAB%5D%29+OR+%28adenylosuccinate+lyase%5BTIAB%5D%29%29+OR+%28adenylosuccinase%5BTIAB%5D%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

- ADENYLOSUCCINATE LYASE; ADSL (https://omim.org/entry/608222)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/158)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=ADSL[gene])

References

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Genomic Location

The *ADSL* gene is found on chromosome 22 (https://medlineplus.gov/genetics/chromosome/22/).

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