STXBP1 gene

syntaxin binding protein 1

Normal Function

The *STXBP1* gene provides instructions for making syntaxin-binding protein 1. In nerve cells (neurons), this protein helps regulate the release of chemical messengers called neurotransmitters from compartments known as synaptic vesicles. The release of neurotransmitters relays signals between neurons and is critical for normal brain function.

To release its neurotransmitters, a synaptic vesicle must join (fuse) with the outer membrane of the neuron. The syntaxin-binding protein 1 regulates the formation of a group (complex) of proteins that allows vesicle fusion.

Health Conditions Related to Genetic Changes

STXBP1 encephalopathy with epilepsy

At least 85 mutations in the *STXBP1* gene have been found to cause *STXBP1* encephalopathy with epilepsy. This condition is characterized by recurrent seizures (epilepsy) that begin in infancy, abnormal brain function (encephalopathy), and intellectual disability. The mutations can alter the structure of the syntaxin-binding protein 1, result in an abnormally short protein, or add or delete small sections of the protein.

The gene mutations that cause STXBP1 encephalopathy with epilepsy reduce the amount of functional syntaxin-binding protein 1 produced from the gene. A shortage of this protein impairs the formation of the protein complex that allows vesicle fusion and the release of neurotransmitters from neurons. A change in neurotransmitter levels can lead to uncontrolled activation (excitation) of neurons, which causes seizures. This altered neuronal activity does not appear to impair the development or survival of neurons; the cause of the encephalopathy and other neurological problems in this condition is unclear.

Lennox-Gastaut syndrome

Other disorders

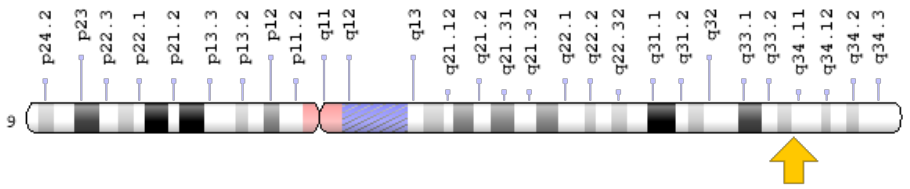
At least three mutations in the *STXBP1* gene have been found to cause a condition called ataxia-tremor-retardation syndrome. This condition is characterized by difficulty coordinating movements (ataxia), involuntary trembling (tremors), intellectual disability, and developmental delay. Unlike, *STXBP1* encephalopathy with epilepsy (described above), individuals with ataxia-tremor-retardation syndrome do not

develop seizures. It is unclear why *STXBP1* gene mutations cause seizures in some individuals and not in others.

Chromosomal Location

Cytogenetic Location: 9q34.11, which is the long (q) arm of chromosome 9 at position 34.11

Molecular Location: base pairs 127,612,207 to 127,692,716 on chromosome 9 (Homo sapiens Annotation Release 109, GRCh38.p12) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- hUNC18
- MUNC18-1
- N-Sec1
- neuronal SEC1
- NSEC1
- RBSEC1
- unc-18A
- UNC18
- unc18-1

Additional Information & Resources

Educational Resources

- Jasper's Basic Mechanisms of the Epilepsies (fourth edition, 2012): Haploinsufficiency of STXBP1 and Ohtahara syndrome https://www.ncbi.nlm.nih.gov/books/NBK98196/
- Molecular Cell Biology (fourth edition, 2000): Multiple Proteins Participate in Docking and Fusion of Synaptic Vesicles https://www.ncbi.nlm.nih.gov/books/NBK21521/#A6193

Clinical Information from GeneReviews

- STXBP1 Encephalopathy with Epilepsy
  https://www.ncbi.nlm.nih.gov/books/NBK396561

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28STXBP1%5BTIAB%5D%29+OR+%28syntaxin+binding+protein+1%5BTIAB%5D%29+OR+%28MUNC18-1%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+1800+days%22%5Bdp%5D

Catalog of Genes and Diseases from OMIM

- SYNTAXIN-BINDING PROTEIN 1
  http://omim.org/entry/602926

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
  http://atlasgeneticsoncology.org/Genes/GC_STXBP1.html
- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=STXBP1%5Bgene%5D
- HGNC Gene Symbol Report
  https://www.genenames.org/data/gene-symbol-report/#!/hgnc_id/HGNC:11444
- Monarch Initiative
  https://monarchinitiative.org/gene/NCBIGene:6812
- NCBI Gene
  https://www.ncbi.nlm.nih.gov/gene/6812
- UniProt
  https://www.uniprot.org/uniprot/P61764

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