

## TSEN54 gene

tRNA splicing endonuclease subunit 54

### Normal Function

The *TSEN54* gene provides instructions for making one part (subunit) of an enzyme called the tRNA splicing endonuclease complex. This complex helps process several types of RNA molecules, which are chemical cousins of DNA.

The tRNA splicing endonuclease complex is particularly important for the normal processing of a form of RNA known as transfer RNA (tRNA). tRNA molecules help assemble protein building blocks called amino acids into full-length proteins. However, before they can assemble proteins, tRNAs must be processed into mature molecules. In particular, regions called introns need to be removed from some tRNAs for the molecules to be functional. The tRNA splicing endonuclease complex recognizes and then removes introns to help produce mature tRNA molecules.

Studies suggest that the tRNA splicing endonuclease complex may also be involved in processing another form of RNA known as messenger RNA (mRNA). mRNA serves as a genetic blueprint for making proteins. Researchers suspect that the tRNA splicing endonuclease complex cuts (cleaves) one end of mRNA molecules so a string of adenines (one of the building blocks of RNA) can be added. This process is known as polyadenylation, and the string of adenines is known as a poly(A) tail. The poly(A) tail signals the stopping point for protein production and protects mRNA from being broken down before protein production occurs.

### Health Conditions Related to Genetic Changes

#### Pontocerebellar hypoplasia

Several mutations in the *TSEN54* 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. *TSEN54* gene mutations are the most frequent cause of a form of the disorder designated pontocerebellar hypoplasia type 2 (PCH2). When PCH2 results from *TSEN54* gene mutations, it is sometimes categorized more specifically as PCH2A. Mutations in the *TSEN54* gene also cause pontocerebellar hypoplasia type 4 (PCH4) and appear to be a rare cause of pontocerebellar hypoplasia type 1 (PCH1).

The most common mutation in the *TSEN54* gene replaces the amino acid alanine with the amino acid serine at position 307 in the TSEN54 protein (written as Ala307Ser or A307S). About 90 percent of all people with PCH2 have this mutation in both copies of the *TSEN54* gene in each cell. At least one person diagnosed with PCH1 also had the mutation in both copies of the gene. Most individuals with PCH4 have the common Ala307Ser mutation in one copy of the *TSEN54* gene in each cell and a different mutation in the other copy of the gene.

The *TSEN54* gene mutations that cause pontocerebellar hypoplasia impair the function of the tRNA splicing endonuclease complex, which likely disrupts the processing of RNA molecules and affects the production of many types of proteins. Before birth, these changes appear to have the most severe impact on fast-growing tissues, such as those in the brain. However, it is unknown exactly how reduced function of the tRNA splicing endonuclease complex leads to abnormal brain development in people with pontocerebellar hypoplasia.

### Other Names for This Gene

- FLJ37147
- SEN54
- SEN54\_HUMAN
- SEN54L
- tRNA splicing endonuclease 54 homolog
- tRNA splicing endonuclease 54 homolog (*S. cerevisiae*)
- tRNA-intron endonuclease Sen54
- TSEN54 tRNA splicing endonuclease subunit

### Additional Information & Resources

#### Tests Listed in the Genetic Testing Registry

- Tests of TSEN54 ([https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=283989\[geneid\]](https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=283989[geneid]))

#### Scientific Articles on PubMed

- PubMed (<https://pubmed.ncbi.nlm.nih.gov/?term=%28%28TSEN54%5BTIAB%5D%29+OR+%28tRNA+splicing+endonuclease%5BTIAB%5D%29%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5BIa%5D+AND+human%5Bmh%5D%29%29>)

#### Catalog of Genes and Diseases from OMIM

- tRNA SPLICING ENDONUCLEASE, SUBUNIT 54; TSEN54 (<https://omim.org/entry/>)

## Gene and Variant Databases

- NCBI Gene (<https://www.ncbi.nlm.nih.gov/gene/283989>)
- ClinVar ([https://www.ncbi.nlm.nih.gov/clinvar?term=TSEN54\[gene\]](https://www.ncbi.nlm.nih.gov/clinvar?term=TSEN54[gene]))

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## **Genomic Location**

The *TSEN54* gene is found on chromosome 17 (<https://medlineplus.gov/genetics/chromosome/17/>).

**Last updated November 1, 2014**