

AFF4 gene

ALF transcription elongation factor 4

Normal Function

The *AFF4* gene provides instructions for making part of a protein complex called the super elongation complex (SEC). During embryonic development, the SEC is involved in an activity called transcription, which is the first step in the production of proteins from genes. By re-starting the transcription of certain genes after pauses that normally occur during the process, the SEC helps ensure that development proceeds appropriately before birth.

Health Conditions Related to Genetic Changes

CHOPS syndrome

Mutations in the *AFF4* gene cause CHOPS syndrome, a disorder involving multiple abnormalities that are present from birth (congenital). The name "CHOPS" is an abbreviation for a list of features of the disorder including cognitive impairment, coarse facial features, heart defects, obesity, lung (pulmonary) involvement, short stature, and skeletal abnormalities.

The *AFF4* gene mutations identified in people with CHOPS syndrome change single protein building blocks (amino acids) in the AFF4 protein. These mutations are thought to result in an AFF4 protein that is not broken down when it is no longer needed, so more AFF4 protein is available than usual. The excess AFF4 protein interferes with normal pauses in transcription. This dysregulation of transcription leads to problems in the development of multiple organs and tissues, resulting in the signs and symptoms of CHOPS syndrome.

Cancers

The *AFF4* gene is occasionally involved in chromosomal rearrangements (translocations) that are found in certain blood cancers called infant acute lymphoblastic leukemia and mixed lineage leukemia. The translocations fuse the *AFF4* gene with another gene called *KMT2A* (formerly known as *MLL*). The fusion gene provides instructions for making an abnormal protein that combines features of the proteins produced from *AFF4* and *KMT2A*. The abnormal protein likely disrupts the transcription elongation function of the SEC, which alters normal gene activity (expression) and

results in the uncontrolled growth of cells that occurs in leukemia. Researchers are working to determine the specific effects of the abnormalities and how they lead to these particular cancers.

Other Names for This Gene

- AF4/FMR2 family, member 4
- AF5Q31
- ALL1-fused gene from chromosome 5q31 protein
- major CDK9 elongation factor-associated protein
- MCEF

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of AFF4 ([https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=27125\[geneid\]](https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=27125[geneid]))

Scientific Articles on PubMed

- PubMed (<https://pubmed.ncbi.nlm.nih.gov/?term=%28%28AFF4%5BTIAB%5D%29+OR+%28AF4/FMR2+family,+member+4%5BTIAB%5D%29%29+OR+%28%28AF4/FMR2+family+member+4%5BTIAB%5D%29+OR+%28AF5Q31%5BTIAB%5D%29+OR+%28ALL1-fused+gene+from+chromosome+5q31+protein%5BTIAB%5D%29+OR+%28CHOPS%5BTIAB%5D%29+OR+%28MCEF%5BTIAB%5D%29+OR+%28major+CDK9+elongation+factor-associated+protein%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+2160+days%22%5Bdp%5D%29>)

Catalog of Genes and Diseases from OMIM

- ALF TRANSCRIPTION ELONGATION FACTOR 4; AFF4 (<https://omim.org/entry/604417>)

Gene and Variant Databases

- NCBI Gene (<https://www.ncbi.nlm.nih.gov/gene/27125>)
- ClinVar ([https://www.ncbi.nlm.nih.gov/clinvar?term=AFF4\[gene\]](https://www.ncbi.nlm.nih.gov/clinvar?term=AFF4[gene]))

References

- He N, Chan CK, Sobhian B, Chou S, Xue Y, Liu M, Alber T, Benkirane M, Zhou Q. Human Polymerase-Associated Factor complex (PAFc) connects the Super ElongationComplex (SEC) to RNA polymerase II on chromatin. *Proc Natl Acad Sci U S A*. 2011 Sep 6;108(36):E636-45. doi: 10.1073/pnas.1107107108. Epub 2011 Aug 22. Citation on PubMed (<https://pubmed.ncbi.nlm.nih.gov/21873227>) or Free article on PubMed Central (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3169135/>)
- Izumi K, Nakato R, Zhang Z, Edmondson AC, Noon S, Dulik MC, Rajagopalan R, Venditti CP, Gripp K, Samanich J, Zackai EH, Deardorff MA, Clark D, Allen JL, Dorsett D, Misulovin Z, Komata M, Bando M, Kaur M, Katou Y, Shirahige K, Krantz ID. Germline gain-of-function mutations in *AFF4* cause a developmental syndrome functionally linking the super elongation complex and cohesin. *Nat Genet*. 2015 Apr;47(4):338-44. doi: 10.1038/ng.3229. Epub 2015 Mar 2. Citation on PubMed (<https://pubmed.ncbi.nlm.nih.gov/25730767>) or Free article on PubMed Central (<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4380798/>)
- Luo Z, Lin C, Shilatifard A. The super elongation complex (SEC) family intrascriptonal control. *Nat Rev Mol Cell Biol*. 2012 Sep;13(9):543-7. doi:10.1038/nrm3417. Epub 2012 Aug 16. Citation on PubMed (<https://pubmed.ncbi.nlm.nih.gov/22895430>)
- Scholz B, Kowarz E, Rossler T, Ahmad K, Steinhilber D, Marschalek R. AF4 and AF4N protein complexes: recruitment of P-TEFb kinase, their interactome and potential functions. *Am J Blood Res*. 2015 Jun 15;5(1):10-24. eCollection 2015. Citation on PubMed (<https://pubmed.ncbi.nlm.nih.gov/26171280>) or Free article on PubMed Central (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4497493/>)
- Smith E, Lin C, Shilatifard A. The super elongation complex (SEC) and MLL in development and disease. *Genes Dev*. 2011 Apr 1;25(7):661-72. doi:10.1101/gad.2015411. Citation on PubMed (<https://pubmed.ncbi.nlm.nih.gov/21460034>) or Free article on PubMed Central (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3070929/>)
- Taki T, Kano H, Taniwaki M, Sako M, Yanagisawa M, Hayashi Y. AF5q31, a newly identified AF4-related gene, is fused to MLL in infant acute lymphoblastic leukemia with *ins(5;11)(q31;q13q23)*. *Proc Natl Acad Sci U S A*. 1999 Dec 7;96(25):14535-40. doi: 10.1073/pnas.96.25.14535. Citation on PubMed (<https://pubmed.ncbi.nlm.nih.gov/10588740>) or Free article on PubMed Central (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC24471/>)

Genomic Location

The *AFF4* gene is found on chromosome 5 (<https://medlineplus.gov/genetics/chromosome/5/>).

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