ALX3 gene

ALX homeobox 3

Normal Function

The *ALX3* gene provides instructions for making a protein that is a member of the homeobox protein family. Homeobox proteins direct the formation of body structures during early embryonic development. The ALX3 protein is necessary for normal development of the head and face, particularly the formation of the nose, which begins around the fourth week of development. The ALX3 protein is a transcription factor, which means that it attaches (binds) to DNA and controls the activity of certain genes. Specifically, the protein controls the activity of genes that regulate cell growth and division (proliferation) and movement (migration), ensuring that cells grow and stop growing at specific times and that they are positioned correctly during development.

Health Conditions Related to Genetic Changes

Frontonasal dysplasia

At least seven mutations in the *ALX3* gene have been found to cause frontonasal dysplasia. *ALX3* gene mutations cause a form of the disorder called frontonasal dysplasia type 1, which particularly affects the development of the nose and surrounding tissues. *ALX3* gene mutations that cause this condition severely reduce or eliminate the function of the ALX3 protein. As a result, the protein cannot bind to DNA and regulate gene function, which leads to poorly controlled cell proliferation and migration during development. This abnormal cell growth and movement impairs development of structures in the middle of the face, particularly the nose, leading to openings (clefts) in the nose. This abnormal development can also interfere with the proper formation of the skull, leading to the skull malformations typical of frontonasal dysplasia type 1.

Other Names for This Gene

- aristaless-like homeobox 3
- FND
- FND1
- frontonasal dysplasia
- homeobox protein aristaless-like 3

- proline-rich transcription factor ALX3

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of ALX3 (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=257[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28ALX3%5BTIAB%5D%29+OR+%28aristaless-like+homeobox+3%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

- ARISTALESS-LIKE HOMEOBOX 3; ALX3 (https://omim.org/entry/606014)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/257)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=ALX3[gene])

References

- McGonnell IM, Graham A, Richardson J, Fish JL, Depew MJ, Dee CT, Holland PW, Takahashi T. Evolution of the Alx homeobox gene family: parallel retention andindependent loss of the vertebrate Alx3 gene. Evol Dev. 2011Jul-Aug;13(4):343-51. doi: 10.1111/j.1525-142X.2011.00489.x. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/21740507) or Free article on PubMed Central (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3166657/)
- Pham NS, Rafii A, Liu J, Boyadjiev SA, Tollefson TT. Clinical and geneticcharacterization of frontorhiny: report of 3 novel cases and discussion of thesurgical management. Arch Facial Plast Surg. 2011 Nov-Dec;13(6):415-20. doi: 10.1001/archfacial.2011.684. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/22106187)
- Twigg SR, Versnel SL, Nurnberg G, Lees MM, Bhat M, Hammond P, Hennekam RC,Hoogeboom AJ, Hurst JA, Johnson D, Robinson AA, Scambler PJ, Gerrelli D, NurnbergP, Mathijssen IM, Wilkie AO. Frontorhiny, a distinctive presentation offrontonasal dysplasia caused by recessive mutations in the ALX3 homeobox gene. AmJ Hum Genet. 2009 May;84(5):698-705. doi: 10.1016/j.ajhg.2009.04.009. Epub 2009Apr 30. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/19409524) or

Free article on PubMed Central (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2681074/)

Genomic Location

The *ALX3* gene is found on chromosome 1 (https://medlineplus.gov/genetics/chromosome/1/).

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