TPM2 gene

tropomyosin 2

Normal Function

The *TPM2* gene provides instructions for making a protein called beta (β)-tropomyosin, which is part of the tropomyosin protein family. Tropomyosin proteins regulate the tensing of muscle fibers (muscle contraction) by controlling the binding of two muscle proteins, myosin and actin. In non-muscle cells, tropomyosin proteins play a role in controlling cell shape.

β-tropomyosin is found primarily in skeletal muscles, which are the muscles used for movement. This protein helps regulate muscle contraction by interacting with other muscle proteins, particularly myosin and actin. These interactions are essential for stabilizing and maintaining structures called sarcomeres within muscle cells. Sarcomeres are the basic units of muscle contraction; they are made of proteins that generate the mechanical force needed for muscles to contract.

Health Conditions Related to Genetic Changes

Cap myopathy

At least three *TPM2* gene mutations have been identified in people with cap myopathy, a disorder that leads to muscle weakness (myopathy) and poor muscle tone (hypotonia). These mutations delete or duplicate genetic material in the *TPM2* gene or replace single protein building blocks (amino acids) in the β-tropomyosin protein sequence. The specific effects of these *TPM2* gene mutations are unclear, but researchers suggest they may interfere with normal actin-myosin binding, impairing muscle contraction and resulting in the muscle weakness that occurs in cap myopathy.

Distal arthrogryposis type 1

At least three mutations in the *TPM2* gene have been found to cause distal arthrogryposis type 1, a disorder characterized by joint deformities (contractures) in the hands and feet. It is unclear how these mutations lead to contractures in people with distal arthrogryposis type 1, or why the joint problems are typically limited to the hands and feet. However, researchers speculate that contractures may be related to problems with muscle contraction that limit the movement of joints before birth.

Congenital fiber-type disproportion

MedlinePlus Genetics provides information about Congenital fiber-type disproportion

Nemaline myopathy

MedlinePlus Genetics provides information about Nemaline myopathy

Sheldon-Hall syndrome

At least six *TPM2* gene mutations have been identified in people with Sheldon-Hall syndrome, a muscle and skeletal disorder similar to distal arthrogryposis type 1 (described above) that impairs joint movement in the hands and feet. Mutations in the *TPM2* gene may alter the structure of β-tropomyosin and disrupt the protein's normal function in controlling muscle contractions, resulting in the contractures and other muscle and skeletal abnormalities associated with this condition.

Other Names for This Gene

- beta-tropomyosin
- NEM4
- TMSB
- TPM2_HUMAN
- tropomyosin 2 (beta)
- tropomyosin beta chain
- tropomyosin, skeletal muscle beta
- tropomyosin-2

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of TPM2 (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=7169[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28%28TPM2%5BTIAB%5D%29+OR+%28tropomyosin+2%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+3600+days%22%5Bdp%5D)

Catalog of Genes and Diseases from OMIM

- TROPOMYOSIN 2; TPM2 (https://omim.org/entry/190990)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/7169)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=TPM2[gene])

References

- Beck AE, McMillin MJ, Gildersleeve HI, Kezele PR, Shively KM, Carey JC,Regnier M, Bamshad MJ. Spectrum of mutations that cause distal arthrogryposistypes 1 and 2B. Am J Med Genet A. 2013 Mar;161A(3):550-5. doi:10.1002/ajmg.a.35809. Epub 2013 Feb 7. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/23401156) or Free article on PubMed Central (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3581718/)
- Clarke NF, Domazetovska A, Waddell L, Kornberg A, McLean C, North KN. Capdisease due to mutation of the beta-tropomyosin gene (TPM2). Neuromuscul Disord.2009 May;19(5):348-51. doi: 10.1016/j.nmd.2009.03.003. Epub 2009 Apr 3. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/19345583)
- Donner K, Ollikainen M, Ridanpaa M, Christen HJ, Goebel HH, de Visser M, PelinK, Wallgren-Pettersson C. Mutations in the beta-tropomyosin (TPM2) gene--a rarecause of nemaline myopathy. Neuromuscul Disord. 2002 Feb;12(2):151-8. doi: 10.1016/s0960-8966(01)00252-8. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/11738357)
- Goebel HH. Cap disease uncapped. Neuromuscul Disord. 2007 Jun;17(6):429-32. doi: 10.1016/j.nmd.2007.03.011. Epub 2007 Apr 16. No abstract available. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/17434306)
- Lehtokari VL, Ceuterick-de Groote C, de Jonghe P, Marttila M, Laing NG, PelinK, Wallgren-Pettersson C. Cap disease caused by heterozygous deletion of thebeta-tropomyosin gene TPM2. Neuromuscul Disord. 2007 Jun;17(6):433-42. doi:10.1016/j.nmd.2007.02.015. Epub 2007 Apr 16. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/17434307)
- Marttila M, Lemola E, Wallefeld W, Memo M, Donner K, Laing NG, Marston S, Gronholm M, Wallgren-Pettersson C. Abnormal actin binding of aberrantbeta-tropomyosins is a molecular cause of muscle weakness in TPM2-related nemalineand cap myopathy. Biochem J. 2012 Feb 15;442(1):231-9. doi: 10.1042/BJ20111030. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/22084935)
- Monnier N, Lunardi J, Marty I, Mezin P, Labarre-Vila A, Dieterich K, Jouk PS. Absence of beta-tropomyosin is a new cause of Escobar syndrome associated withnemaline myopathy. Neuromuscul Disord. 2009 Feb;19(2):118-23. doi:10.1016/j.nmd.2008.11.009. Epub 2009 Jan 19. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/19155175)
- Ochala J. Thin filament proteins mutations associated with skeletalmyopathies: defective regulation of muscle contraction. J Mol Med (Berl). 2008Nov;86(11):1197-

204. doi: 10.1007/s00109-008-0380-9. Epub 2008 Jun 24. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/18574571)

- Ohlsson M, Quijano-Roy S, Darin N, Brochier G, Lacene E, Avila-Smirnow D, Fardeau M, Oldfors A, Tajsharghi H. New morphologic and genetic findings in capdisease associated with beta-tropomyosin (TPM2) mutations. Neurology. 2008 Dec2;71(23):1896-901. doi: 10.1212/01.wnl.0000336654.44814.b8. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/19047562)
- Sung SS, Brassington AM, Grannatt K, Rutherford A, Whitby FG, Krakowiak PA, Jorde LB, Carey JC, Bamshad M. Mutations in genes encoding fast-twitchcontractile proteins cause distal arthrogryposis syndromes. Am J Hum Genet. 2003Mar;72(3): 681-90. doi: 10.1086/368294. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/12592607) or Free article on PubMed Central (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1180243/)
- Tajsharghi H, Kimber E, Holmgren D, Tulinius M, Oldfors A. Distalarthrogryposis and muscle weakness associated with a beta-tropomyosin mutation.Neurology. 2007 Mar 6;68(10):772-5. doi: 10.1212/01.wnl.0000256339.40667.fb. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/17339586)
- Tajsharghi H, Ohlsson M, Lindberg C, Oldfors A. Congenital myopathy withnemaline rods and cap structures caused by a mutation in the beta-tropomyosingene (TPM2). Arch Neurol. 2007 Sep;64(9):1334-8. doi: 10.1001/archneur.64.9.1334. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/17846275)

Genomic Location

The *TPM2* gene is found on chromosome 9 (https://medlineplus.gov/genetics/chromosome/9/).

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