SELENON gene

selenoprotein N

Normal Function

The *SELENON* gene (also called *SEPN1*) provides instructions for making a protein called selenoprotein N. This protein is part of a family of selenoproteins, which have several critical functions within the body. Selenoproteins are primarily involved in chemical reactions called oxidation-reduction reactions, which are essential for protecting cells from damage caused by unstable oxygen-containing molecules. Although the exact function of selenoprotein N is unknown, it is likely involved in protecting cells against oxidative stress. Oxidative stress occurs when unstable molecules called free radicals accumulate to levels that damage or kill cells.

Selenoprotein N is highly active in many tissues before birth and may be involved in the formation of muscle tissue (myogenesis). The protein may also be important for normal muscle function after birth, although it is active at much lower levels in adult tissues. This protein is thought to play a role in maintaining an appropriate balance of calcium (calcium homeostasis) in cells. Calcium plays an important role in muscle movement.

Health Conditions Related to Genetic Changes

Multiminicore disease

At least 17 mutations in the *SELENON* gene have been identified in people with the classic form of multiminicore disease. This condition is named for a distinctive abnormality in the muscle fibers called minicores (which can only be seen with a microscope). In addition, affected individuals have muscle weakness, particularly in the muscles of the torso and neck (the axial muscles); abnormal curvature of the spine (scoliosis); and serious breathing problems. Many of the genetic changes that cause classic multiminicore disease lead to the production of an abnormally short version of selenoprotein N. Other mutations change single protein building blocks (amino acids) in critical regions of the protein. The effects of changes in the structure and function of selenoprotein N are unknown, and researchers are working to determine how these changes lead to muscle weakness and the other characteristic features of classic multiminicore disease.

Rigid spine muscular dystrophy

More than a dozen *SELENON* gene mutations have been found to cause rigid spine muscular dystrophy 1 (RSMD1). In people with this disorder, the muscles surrounding the spine weaken and waste away (atrophy), and the joints in the spine develop deformities called contractures that restrict movement. Affected children have limited ability to move their heads up and down or side to side. They also develop scoliosis and have serious breathing problems during sleep.

The *SELENON* gene mutations that cause RSMD1 are thought to reduce the amount of selenoprotein N or impair its activity in cells. It is unclear how a shortage of functional selenoprotein N affects the formation of muscle tissue or the function of muscles. Researchers are working to determine why axial muscles are particularly affected by *SELENON* gene mutations.

Congenital fiber-type disproportion

MedlinePlus Genetics provides information about Congenital fiber-type disproportion

Other disorders

Mutations in the *SELENON* gene are involved in another rare muscle disorder called desmin-related myopathy with Mallory body-like inclusions. This disorder is characterized by the presence of small clusters of accumulated proteins in the muscle fibers. These abnormal regions can only be seen when muscle tissue is viewed under a microscope. The inclusions resemble an abnormality known as Mallory bodies. As in other *SELENON*-related muscle disorders (described above), desmin-related myopathy with Mallory body-like inclusions is characterized by axial muscle weakness, spine stiffness, scoliosis, and serious breathing problems. Because they have a similar pattern of signs and symptoms and are caused by mutations in the same gene, many researchers believe that these conditions are all part of a single syndrome with variable signs and symptoms. Together, muscle diseases caused by *SELENON* gene mutations are known as *SELENON*-related (or *SEPN1*-related) myopathy. It is unclear why mutations in the *SELENON* gene cause the different muscle fiber abnormalities that distinguish these disorders.

Other Names for This Gene

- selenoprotein N, 1
- SELN
- SEPN1
- SEPN1_HUMAN

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of SELENON (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=57190[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28%28SEPN1%5BTIAB%5D%29+OR+%28selenoprotein+N,+1%5BTIAB%5D%29%29+OR+%28SELN%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+1080+days%22%5Bdp%5D)

Catalog of Genes and Diseases from OMIM

- SELENOPROTEIN N; SELENON (https://omim.org/entry/606210)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/57190)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=SELENON[gene])

References

- Arbogast S, Beuvin M, Fraysse B, Zhou H, Muntoni F, Ferreiro A. Oxidativestress in SEPN1-related myopathy: from pathophysiology to treatment. Ann Neurol.2009 Jun; 65(6):677-86. doi: 10.1002/ana.21644. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/19557870)
- Ardissone A, Bragato C, Blasevich F, Maccagnano E, Salerno F, Gandioli C, Morandi L, Mora M, Moroni I. SEPN1-related myopathy in three patients: novelmutations and diagnostic clues. Eur J Pediatr. 2016 Aug;175(8):1113-8. doi:10.1007/s00431-015-2685-3. Epub 2016 Jan 16. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/26780752)
- Castets P, Bertrand AT, Beuvin M, Ferry A, Le Grand F, Castets M, Chazot G, Rederstorff M, Krol A, Lescure A, Romero NB, Guicheney P, Allamand V. Satellitecell loss and impaired muscle regeneration in selenoprotein N deficiency. Hum MolGenet. 2011 Feb 15;20(4):694-704. doi: 10.1093/hmg/ddq515. Epub 2010 Dec 2. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/21131290)
- Castets P, Lescure A, Guicheney P, Allamand V. Selenoprotein N in skeletalmuscle: from diseases to function. J Mol Med (Berl). 2012 Oct;90(10):1095-107.doi: 10.1007/s00109-012-0896-x. Epub 2012 Apr 14. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/22527882)
- Clarke NF, Kidson W, Quijano-Roy S, Estournet B, Ferreiro A, Guicheney P, Manson JI, Kornberg AJ, Shield LK, North KN. SEPN1: associated with congenitalfiber-type disproportion and insulin resistance. Ann Neurol. 2006Mar;59(3): 546-52. doi: 10.1002/ana.20761. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/16365872)

- Ferreiro A, Ceuterick-de Groote C, Marks JJ, Goemans N, Schreiber G, HanefeldF, Fardeau M, Martin JJ, Goebel HH, Richard P, Guicheney P, Bonnemann CG. Desmin-related myopathy with Mallory body-like inclusions is caused by mutationsof the selenoprotein N gene. Ann Neurol. 2004 May;55(5):676-86. doi:10.1002/ana.20077. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/15122708)
- Ferreiro A, Quijano-Roy S, Pichereau C, Moghadaszadeh B, Goemans N, BonnemannC, Jungbluth H, Straub V, Villanova M, Leroy JP, Romero NB, Martin JJ, Muntoni F,Voit T, Estournet B, Richard P, Fardeau M, Guicheney P. Mutations of theselenoprotein N gene, which is implicated in rigid spine muscular dystrophy, cause the classical phenotype of multiminicore disease: reassessing the nosologyof early-onset myopathies. Am J Hum Genet. 2002 Oct;71(4):739-49. doi:10.1086/342719. Epub 2002 Aug 21. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/12192640) or Free article on PubMed Central (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC378532/)
- Jungbluth H. Multi-minicore Disease. Orphanet J Rare Dis. 2007 Jul 13;2:31.doi: 10.1186/1750-1172-2-31. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/17631035) or Free article on PubMed Central (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1947955/)
- Moghadaszadeh B, Petit N, Jaillard C, Brockington M, Quijano Roy S, Merlini L, Romero N, Estournet B, Desguerre I, Chaigne D, Muntoni F, Topaloglu H, GuicheneyP. Mutations in SEPN1 cause congenital muscular dystrophy with spinal rigidityand restrictive respiratory syndrome. Nat Genet. 2001 Sep;29(1):17-8. doi:10.1038/ng713. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/11528383)
- Okamoto Y, Takashima H, Higuchi I, Matsuyama W, Suehara M, Nishihira Y, Hashiguchi A, Hirano R, Ng AR, Nakagawa M, Izumo S, Osame M, Arimura K. Molecularmechanism of rigid spine with muscular dystrophy type 1 caused by novel mutationsof selenoprotein N gene. Neurogenetics. 2006 Jul;7(3):175-83. doi:10.1007/s10048-006-0046-0. Epub 2006 Jun 15. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/16779558)
- Petit N, Lescure A, Rederstorff M, Krol A, Moghadaszadeh B, Wewer UM, Guicheney P. Selenoprotein N: an endoplasmic reticulum glycoprotein with an earlydevelopmental expression pattern. Hum Mol Genet. 2003 May 1;12(9):1045-53. doi:10.1093/hmg/ddg115. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/12700173)
- Schara U, Kress W, Bonnemann CG, Breitbach-Faller N, Korenke CG, Schreiber G, Stoetter M, Ferreiro A, von der Hagen M. The phenotype and long-term follow-up in11 patients with juvenile selenoprotein N1-related myopathy. Eur J PaediatrNeurol. 2008 May;12(3):224-30. doi: 10.1016/j.ejpn.2007.08.011. Epub 2007 Oct 22. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/17951086)
- Zorzato F, Jungbluth H, Zhou H, Muntoni F, Treves S. Functional effects ofmutations identified in patients with multiminicore disease. IUBMB Life. 2007Jan;59(1):14-20. doi: 10.1080/15216540601187803. Citation on PubMed (https://pubmed.ncbi.nlm.nih.gov/17365175)

Genomic Location

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

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