MYH3 gene

myosin heavy chain 3

Normal Function

The *MYH3* gene provides instructions for making a protein called myosin-3. This protein belongs to a group of proteins called myosins, which are involved in movement and the transport of materials within and between cells. In addition, muscle fibers are primarily composed of thick filaments made of myosin and thin filaments of another protein called actin. Thick and thin filaments are involved in muscle tensing (contraction). Muscle fibers containing myosin-3 are found primarily in the fetus before birth, and they are important for early development of the muscles.

Myosins function when they are part of a group (complex). Each myosin complex consists of two pairs of myosin light chains (produced from other genes), which regulate the complex, and one pair of myosin heavy chains such as that produced from the *MYH3* gene. The heavy chains each have two parts: a head region and a tail region. The head region interacts with actin, which allows the thick and thin filaments to move relative to one another so that muscles can contract. The head region also includes a segment that attaches (binds) to ATP, which is a molecule that supplies energy for cells' activities, including muscle contraction. The long tail region of the myosin heavy chain interacts with other proteins, including the tail regions of other myosins, to form thick filaments.

Health Conditions Related to Genetic Changes

Freeman-Sheldon syndrome

Variants (also known as mutations) in the *MYH3* gene cause Freeman-Sheldon syndrome. This disorder affects muscle and skeletal development before birth and is characterized by abnormalities known as contractures that cause a distinctive facial appearance and deformities of the hands and feet. Contractures result from permanent tightening of muscles, skin, and surrounding tissues, and they restrict movement of the affected body part.

Studies suggest that *MYH3* gene variants that cause Freeman-Sheldon syndrome prolong the attachment of myosin to actin, possibly because the variants affect the way myosin uses ATP. Prolonged attachment of myosin to actin keeps the muscle tensed and does not allow it to relax, which prevents movement. It is thought that abnormal

muscle contraction and limited muscle and limb movement during development leads to stiffening of the muscles and surrounding tissues, causing contractures characteristic of Freeman-Sheldon syndrome. Researchers suggest that limited muscle movement before birth impairs normal development of other parts of the body, which may account for other features of Freeman-Sheldon syndrome.

Sheldon-Hall syndrome

MYH3 gene variants can cause Sheldon-Hall syndrome, a muscle and skeletal disorder that impairs joint movement in the hands and feet, similar to but milder than Freeman-Sheldon syndrome (described above). The *MYH3* gene variants that cause Sheldon-Hall syndrome are believed to interfere with the ability of the myosin-3 protein to attach to actin and other muscle proteins, and may also impair the formation of thick filaments. The variants likely prevent muscle contractions from being controlled and interfere with muscle development before birth, resulting in the contractures and other muscle and skeletal abnormalities associated with Sheldon-Hall syndrome.

Spondylocarpotarsal synostosis syndrome

MedlinePlus Genetics provides information about Spondylocarpotarsal synostosis syndrome

Other Names for This Gene

- HEMHC
- muscle embryonic myosin heavy chain
- MYH3_HUMAN
- MYHC-EMB
- MYHSE1
- myosin heavy chain, fast skeletal muscle, embryonic
- myosin, heavy chain 3, skeletal muscle, embryonic
- myosin, heavy polypeptide 3, skeletal muscle, embryonic
- myosin, skeletal, heavy chain, embryonic 1
- myosin-3
- SMHCE

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of MYH3 (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=4621[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28MYH3%5BTIAB%5D%29+OR+%28%28myosin-3%5BTIAB%5D%29+OR+%28MYHC-EMB%5BTIAB%5D%29+OR+%28myosin+heavy+chain+3%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

- MYOSIN, HEAVY CHAIN 3, SKELETAL MUSCLE, EMBRYONIC; MYH3 (https://omim.org/entry/160720)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/4621)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=MYH3[gene])

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Genomic Location

The *MYH3* gene is found on chromosome 17 (https://medlineplus.gov/genetics/chromosome/17/).

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