MYH6 gene

myosin heavy chain 6

Normal Function

The *MYH6* gene provides instructions for making a protein known as the cardiac alpha (α)-myosin heavy chain. This protein is found in heart (cardiac) muscle cells, where it forms part of a larger protein called type II myosin. Type II myosin helps generate the mechanical force that is needed for cardiac muscle to contract, allowing the heart to pump blood to the rest of the body.

Type II myosin is one of the major components of cell structures called sarcomeres. These structures are the basic units of muscle contraction. Sarcomeres are composed of thick filaments made up of type II myosin and thin filaments made up of another protein called actin. The overlapping thick and thin filaments attach to each other and release, which allows the filaments to move relative to one another so that muscles can contract. Sarcomeres also appear to have an important role in the early development of structures in the heart.

Health Conditions Related to Genetic Changes

Sick sinus syndrome

At least one variation of the *MYH6* gene has been associated with an increased risk of developing sick sinus syndrome. This condition affects the function of the sino-atrial (SA) node, which is an area of specialized cells in the heart that functions as a natural pacemaker. The variation, which was identified in the Icelandic population, changes a single protein building block (amino acid) in the α-myosin heavy chain. Specifically, it replaces the amino acid arginine with the amino acid tryptophan at protein position 721 (written as Arg721Trp). Researchers found that about half of the people in their sample who had the Arg721Trp variation developed sick sinus syndrome during their lifetime, compared with about 6 percent of people who did not carry the variation. They speculated that the variation may alter the structure of the α-myosin heavy chain and disrupt its usual role in cardiac muscle contraction. These changes could alter the way the heart beats in some people, leading to an abnormally slow heartbeat (bradycardia) and related symptoms such as dizziness, light-headedness, and fainting (syncope).

Familial dilated cardiomyopathy

MedlinePlus Genetics provides information about Familial dilated cardiomyopathy

Other disorders

Mutations in the *MYH6* gene have been found to cause several additional heart conditions. These include congenital heart defects, particularly atrial-septal defect (ASD) , which is a hole in the wall (septum) that separates the two upper chambers of the heart (the atria). Most of the *MYH6* gene mutations associated with ASD affect a part of the α-myosin heavy chain known as the head domain. This part of the protein is involved in attaching (binding) type II myosin to actin. Abnormal interaction between these two proteins may disrupt early heart development, leading to heart defects such as ASD.

MYH6 gene mutations can also cause two diseases of the cardiac muscle, dilated cardiomyopathy (DCM) and hypertrophic cardiomyopathy (HCM). DCM weakens and enlarges the heart, while HCM is characterized by thickening (hypertrophy) of the cardiac muscle. Both of these conditions prevent the heart from pumping blood efficiently and increase the risk of heart failure and sudden death. Mutations associated with DCM and HCM can affect any part of the α-myosin heavy chain, and most change single amino acids in the protein. These changes likely alter the α-myosin heavy chain in ways that affect the structure and function of cardiac muscle.

Other Names for This Gene

- alpha-MHC
- ASD3
- CMD1EE
- CMH14
- MYH6_HUMAN
- MYHC
- myHC-alpha
- MYHCA
- myosin heavy chain, cardiac muscle alpha isoform
- myosin, heavy chain 6, cardiac muscle, alpha
- myosin, heavy polypeptide 6, cardiac muscle, alpha (cardiomyopathy, hypertrophic 1)
- myosin-6
- SSS3

Additional Information & Resources

Tests Listed in the Genetic Testing Registry

- Tests of MYH6 (https://www.ncbi.nlm.nih.gov/gtr/all/tests/?term=4624[geneid])

Scientific Articles on PubMed

- PubMed (https://pubmed.ncbi.nlm.nih.gov/?term=%28MYH6%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

- MYOSIN, HEAVY CHAIN 6, CARDIAC MUSCLE, ALPHA; MYH6 (https://omim.org/entry/160710)
- CARDIOMYOPATHY, FAMILIAL HYPERTROPHIC, 14; CMH14 (https://omim.org/entry/613251)
- CARDIOMYOPATHY, DILATED, 1EE; CMD1EE (https://omim.org/entry/613252)
- ATRIAL SEPTAL DEFECT 3; ASD3 (https://omim.org/entry/614089)

Gene and Variant Databases

- NCBI Gene (https://www.ncbi.nlm.nih.gov/gene/4624)
- ClinVar (https://www.ncbi.nlm.nih.gov/clinvar?term=MYH6[gene])

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Genomic Location

The *MYH6* gene is found on chromosome 14 (https://medlineplus.gov/genetics/chromosome/14/).

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