CAV3 Gene

Subjects: Genetics & Heredity
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caveolin 3

Keywords: genes

1. Normal Function

The *CAV3* gene provides instructions for making a protein called caveolin-3, which is found in the membrane surrounding muscle cells. This protein is the main component of caveolae, which are small pouches in the muscle cell membrane. Within the caveolae, the caveolin-3 protein acts as a scaffold to organize other molecules that are important for cell signaling and maintenance of the cell structure. These molecules include the proteins that make up sodium channels, which transport positively charged sodium atoms (sodium ions) into cells. Sodium channels play a key role in a cell's ability to generate and transmit electrical signals. In cardiac muscle, sodium channels are involved in maintaining the heart's normal rhythm. Caveolin-3 may also help regulate calcium levels in the muscle cell, which control muscle contraction and relaxation.

2. Health Conditions Related to Genetic Changes

2.1. CAV3-related Distal Myopathy

At least two *CAV3* gene mutations have been identified in people with distal myopathy, a disorder characterized by weakness and loss of function mainly affecting the muscles farthest from the center of the body (distal muscles), such as those of the hands and feet. Mutations that cause *CAV3*-related distal myopathy result in a shortage of caveolin-3 protein in the muscle cell membrane and a reduction in the number of caveolae. Researchers suggest that a shortage of caveolae impairs the structural integrity of muscle cells, interferes with cell signaling, and causes the self-destruction of cells (apoptosis). The resulting breakdown of muscle tissue leads to the signs and symptoms of *CAV3*-related distal myopathy.

2.2. Isolated HyperCKemia

At least four *CAV3* gene mutations have been identified in individuals with isolated hyperCKemia. People with this condition have elevated levels of an enzyme called creatine kinase in the blood. Creatine kinase is released into the blood when muscle cells are damaged; however, people with isolated hyperCKemia have no muscle weakness or other symptoms of muscle disease. *CAV3* gene mutations that cause isolated hyperCKemia lead to a caveolin-3 shortage that likely damages muscle cells. Although the damage is not severe enough to cause noticeable symptoms, it may lead to the elevated blood levels of creatine kinase that characterize isolated hyperCKemia.

2.3. Rippling Muscle Disease

At least 12 *CAV3* gene mutations have been identified in people with rippling muscle disease, a condition in which the muscles are unusually sensitive to movement or pressure (irritable). Affected individuals may have muscle cramps, stiffness, and muscles that appear to ripple when they are stretched.

CAV3 gene mutations that cause rippling muscle disease result in a shortage of caveolin-3 protein in the muscle cell membrane. Researchers suggest that reduced caveolin-3 levels may impair the control of calcium levels in muscle cells, leading to abnormal muscle contractions in response to stimulation.

2.4. Limb-Girdle Muscular Dystrophy

Limb-girdle muscular dystrophy

2.5. Romano-Ward Syndrome

Romano-Ward syndrome

2.6. Other Disorders

CAV3 gene mutations also can cause hypertrophic cardiomyopathy. Hypertrophic cardiomyopathy is a thickening of the heart (cardiac) muscle that forces the heart to work harder to pump blood. This condition can lead to heart failure.

When caused by *CAV3* gene mutations, hypertrophic cardiomyopathy as well as limb-girdle muscular dystrophy, isolated hyperCKemia, rippling muscle disease, and distal myopathy (all described above) are classified as caveolinopathies. Several *CAV3* gene mutations have been found to cause different caveolinopathies in different individuals. It is unclear why a particular *CAV3* gene mutation may cause different patterns of signs and symptoms, even within the same family.

Mutations in the *CAV3* gene have also been identified in people with long QT syndrome, which is a heart condition that causes the cardiac muscle to take longer than usual to recharge between beats. The irregular heartbeats (arrhythmia) can lead to fainting (syncope) or cardiac arrest and sudden death. Researchers suggest that *CAV3* gene mutations may disrupt ion transport through sodium channels located in the caveolae. A disruption in ion transport may alter the way the heart beats, leading to the abnormal heart rhythm characteristic of long QT syndrome.

3. Other Names for This Gene

- CAV3_HUMAN
- caveolin-3
- LGMD1C
- LQT9
- M-caveolin
- MGC126100
- MGC126101
- MGC126129
- VIP-21
- VIP21

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