DMD Gene

Subjects: Genetics & Heredity
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Dystrophin: DMD, the largest known human gene, provides instructions for making a protein called dystrophin.

Keywords: genes

1. Normal Function

This protein is located primarily in muscles used for movement (skeletal muscles) and in heart (cardiac) muscle. Small amounts of dystrophin are present in nerve cells in the brain.

In skeletal and cardiac muscles, dystrophin is part of a group of proteins (a protein complex) that work together to strengthen muscle fibers and protect them from injury as muscles contract and relax. The dystrophin complex acts as an anchor, connecting each muscle cell's structural framework (cytoskeleton) with the lattice of proteins and other molecules outside the cell (extracellular matrix). The dystrophin complex may also play a role in cell signaling by interacting with proteins that send and receive chemical signals.

Little is known about the function of dystrophin in nerve cells. Research suggests that the protein is important for the normal structure and function of synapses, which are specialized connections between nerve cells where cell-to-cell communication occurs.

2. Health Conditions Related to Genetic Changes

2.1 Duchenne and Becker Muscular Dystrophy

More than 2,000 mutations in the *DMD* gene have been identified in people with the Duchenne and Becker forms of muscular dystrophy. These conditions occur almost exclusively in males and are characterized by progressive muscle weakness and wasting (atrophy) and a heart condition called dilated cardiomyopathy. Most of the mutations that cause these conditions delete part of the *DMD* gene. Other mutations abnormally duplicate part of the gene or change a small number of DNA building blocks (nucleotides) in the gene.

Mutations that cause Becker muscular dystrophy, which typically has milder features and appears at a later age than Duchenne muscular dystrophy, usually lead to an abnormal version of dystrophin that retains some function. Mutations that cause the more severe Duchenne muscular dystrophy typically prevent any functional dystrophin from being produced.

Skeletal and cardiac muscle cells without enough functional dystrophin become damaged as the muscles repeatedly contract and relax with use. The damaged cells weaken and die over time, causing the characteristic muscle weakness and heart problems seen in Duchenne and Becker muscular dystrophy.

2.2 X-linked Dilated Cardiomyopathy

More than 30 mutations in the *DMD* gene can cause an X-linked form of familial dilated cardiomyopathy. This heart condition enlarges and weakens the cardiac muscle, preventing the heart from pumping blood efficiently. Although dilated cardiomyopathy is a sign of Duchenne and Becker muscular dystrophy (described above), X-linked dilated cardiomyopathy is typically not associated with weakness and wasting of skeletal muscles.

The mutations that cause X-linked dilated cardiomyopathy preferentially affect the activity of dystrophin in cardiac muscle cells. As a result of these mutations, affected individuals typically have little or no functional dystrophin in the heart. Without enough of this protein, cardiac muscle cells become damaged as the heart muscle repeatedly contracts and relaxes. The damaged muscle cells weaken and die over time, leading to the heart problems characteristic of X-linked dilated cardiomyopathy.

The mutations that cause X-linked dilated cardiomyopathy often lead to reduced amounts of dystrophin in skeletal muscle cells. However, enough of this protein is present to prevent weakness and wasting of the skeletal muscles.

2.3 Familial Dilated Cardiomyopathy

3. Other Names for This Gene

- BMD
- DMD_HUMAN
- dystrophin (muscular dystrophy, Duchenne and Becker types)

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