

What is...

# Duchenne Muscular Dystrophy

**Duchenne muscular dystrophy (DMD)** is the most common form of muscular dystrophy. It is a genetic disorder characterized by progressive weakness and degeneration of the skeletal muscles that control movement.

Duchenne affects approximately **1 in 5,000 live male births**. It is estimated that about **20,000 children are diagnosed** with Duchenne globally each year.

DMD is classified as a dystrophinopathy, a **muscle disease** that results from the **deficiency of a protein called dystrophin**.

In Duchenne, a **mutation in the DMD gene** interferes with the production of the dystrophin protein, which is needed to form and maintain healthy muscle. Lack of the dystrophin protein in muscle cells causes them to be fragile and easily damaged.

Because the *DMD* gene is located on the X-chromosome, it **primarily affects males, while females typically are carriers**. However, some females can experience varying degrees of physical Duchenne symptoms and are therefore called manifesting carriers.

**DMD typically is inherited through the mother**; however, in about 25% of cases, the disease occurs spontaneously in people who do not have a family history of DMD.

There is no cure for DMD, but medications and therapy can help manage some symptoms and potentially slow the course of the disease.



# What are the signs and symptoms of DMD?

DMD is a multi-systemic condition affecting many parts of the body and resulting in atrophy of the skeletal, cardiac (heart), and pulmonary (lung) muscles.



# What should I know about DMD?

- 1 DMD symptom onset occurs in early childhood, usually between the ages of 3 and 5 years.
- 2 Early signs of Duchenne may include delayed ability to sit, stand, or walk, and difficulties learning to speak. Muscle weakness usually begins in the hips, pelvic area, upper legs, and shoulders. The calves may be enlarged.
- 3 Children with DMD typically develop an unusual walk and difficulty running and climbing stairs. Some will have problems getting up from the floor and may use a distinctive method known as Gower's maneuver or Gower's sign to "walk" their hands up their thighs in order to stand up. DMD may also affect learning and memory, as well as communication and certain emotional skills.
- 4 A small percentage of boys with DMD have some degree of learning disability, including problems in three general areas: attention focusing, verbal learning and memory, and emotional interaction.
- 5 Muscle weakness worsens with age and progresses to the arms, legs, and trunk.
- 6 While disease progression varies, boys, on average, lose their ability to walk, and transition to fulltime wheelchair use at age 12.
- 7 Beginning at about 10 years of age, the diaphragm and other muscles that operate the lungs may weaken, making the lungs less effective at moving air in and out. Signs of poor respiratory function can include headaches, difficulty concentrating or staying awake, and nightmares.
- 8 Heart and respiratory muscle problems begin in the teen years and can lead to serious complications.
- 9 Weakened respiratory muscles make it difficult to cough, leading to increased risk of serious respiratory infection. A simple cold can quickly progress to pneumonia.
- 10 Thanks to advances in cardiac and respiratory care, life expectancy for individuals with DMD is increasing and many young adults with DMD attend college, have careers, get married, and have children.
- 11 Survival into the early 30s is becoming more common, and there are cases of men with DMD living into their 40s and 50s.

# How is DMD treated?

Physical therapy through exercise helps to restore and maintain muscle strength and function. Stretching helps to maintain range of motion.

Braces, also called orthoses, support the ankle and foot or may extend up over the knee. Ankle-foot orthoses (AFOs) are sometimes prescribed for night wear to keep the foot from pointing downward and keep the Achilles tendon stretched while a child is sleeping.

Occupational therapy can help improve daily living and work skills.

Assisted ventilation can help treat respiratory muscle weakness.



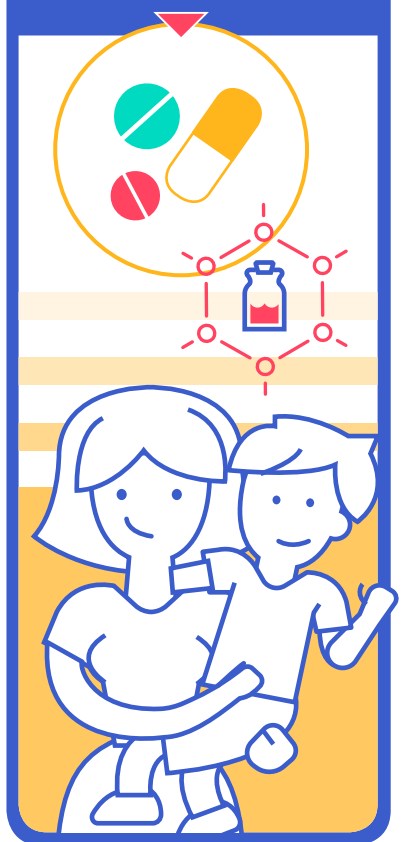
Corrective orthopedic surgery, including spine-straightening surgery, may help make sitting, sleeping, and breathing more comfortable.

Treatment with angiotensin converting enzyme (ACE) inhibitors and beta blockers may be used to slow the course of cardiac muscle deterioration in DMD.

**Exondys 51\*** is an "exon skipping" drug that targets a section of DNA called exon 51. It is approved by the FDA for treatment of individuals who have a confirmed mutation of the *DMD* gene that is amenable to a therapeutic strategy called exon 51 skipping and may help up to 13% of individuals with DMD. Exondys 51 is not a cure for DMD, but it potentially could lessen the severe muscle weakness and atrophy that is the hallmark of the disease.

**Emflaza\*** is the only corticosteroid that has been approved by the US Food and Drug Administration for the treatment of Duchenne in individuals 5 years of age and older.

Corticosteroids (such as prednisone) are commonly used in DMD to help preserve muscle strength and function, to prevent scoliosis, and to prolong the time that people with DMD can walk. It's thought that steroids work, at least in part, by reducing inflammation. However, corticosteroids also cause unwanted side effects such as increased appetite, weight gain, loss of bone mass, and cataracts.



\*Please talk to your medical provider to obtain more information on these treatments.



## MDA Glossary

### **Atrophy**

A decrease in the size and mass of muscle tissue

### **Cardiomyopathy**

A condition in which the heart muscle is weakened, making it harder for the heart to pump blood to the body

### **Contracture**

A shortening of muscles or tendons around joints that can limit mobility

### **Corticosteroids**

A group of steroid hormones that have been shown to dampen the inflammatory response in damaged muscle

### **Dysphagia**

Difficulty swallowing

### **Exon skipping**

A treatment strategy in which sections of genetic code are “skipped,” allowing cells to manufacture partially functional dystrophin, the muscle protein missing in DMD

### **Gastroparesis**

Also known as delayed gastric emptying; a condition that affects the ability of the stomach to empty its contents into the small intestine, even though there is no blockage

### **Gower’s maneuver**

A person’s use of their hands and arms to “walk” up their own body in order to rise from a squatting position; this medical sign indicates weakness of the muscles in the hips and legs

### **Lordosis**

Posture characterized by an inward curving of the lower back

### **Muscular dystrophy**

A term that refers to a number of diseases that cause progressive loss of muscle mass, resulting in weakness and, sometimes, loss of mobility

### **Mutation**

A flaw in the DNA code

### **Pseudohypertrophy**

A condition in which muscles become enlarged with deposits of fat and fibrous tissue

### **Scoliosis**

An abnormal sideways curvature in the spine that occurs when weakened muscles are unable to hold the spine straight

**To learn more about DMD, visit [mda.org](http://mda.org) or contact the MDA National Resource Center at 833-ASK-MDA1 (275-6321).**



Designated a Top-Rated Charity by the American Institute of Philanthropy, MDA is the first nonprofit to receive a Lifetime Achievement Award from the American Medical Association for “significant and lasting contributions to the health and welfare of humanity.”



Muscular Dystrophy Association

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