

Muscle contraction

Muscle contraction is the activation of tension-generating sites within muscle fibers. The muscle contracts when it is stimulated. Contraction by a physical or mechanical event. It is a sudden and painful event that reflects an involuntary contraction of one or more muscles. In addition, several other changes occur in the muscle.

Changes taking place during muscular contraction:

1. Electrical changes
2. Physical changes
3. Histological (molecular) changes
4. Chemical changes
5. Thermal changes



Symptoms

1. Sudden and severe muscle pain.
2. Muscle contraction and spasm.
3. Leg swelling, redness, or skin changes.
4. Feeling of strong swelling of the muscle tissue under the skin.

Reasons

Excessive muscle use, dehydration, muscle fatigue stay one position for a long time can cause a muscle cramp. In many cases, however, the cause is unknown

Although most muscle spasms are harmful, some may be related to an underlying medical condition, such as

1. Not flowing enough blood. Narrowing of the arteries that carry blood to your legs (atherosclerosis in the extremities) can cause cramping pain in your legs and feet during exercise. These cramps usually go away soon after you stop exercising
2. nerve compression. Compression of nerves in your spine (lumbar stenosis) may also cause cramping pain in your legs. The pain usually gets worse the longer you walk.
3. Mineral deficiency. Too low levels of potassium, calcium or magnesium in your diet may cause leg cramps.

Risk factors

Factors that may increase your risk of developing a muscle cramp include :-

- **Age.** Older people lose some muscle mass, so the remaining muscles can easily contraction
- **Drought.** Athletes who become tired and dehydrated while participating in summer sports frequently develop cramps

- **Pregnancy.** Muscle cramps are common during pregnancy.
- **Medical conditions.** You may be at a higher risk of a muscle cramp if you have diabetes or nerve, liver or thyroid disorders.

Types of contractions

Muscle contractions can be described based on two variables: length and tension. muscle contraction is described as **isometric** if the muscle tension changes but the muscle length remains the same. In contrast, a muscle contraction is **isotonic** if muscle tension remains the same throughout the contraction. If the muscle length shortens, the contraction is **concentric**; if the muscle length lengthens, the contraction is **eccentric**. In natural movements that underlie muscle contractions are multifaceted as they are able to produce changes in length and tension in a time-varying manner. Therefore, neither length nor tension is likely to remain the same in muscles that contract during locomotor activity

Types of Contractions

- **Isotonic** – muscle contracts and changes length
 - **Concentric** – shortening contraction
 - **Eccentric** – lengthening contraction
- **Isometric** – muscle contracts but does not change length

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Contractions in the muscle

skeletal muscle contractions are neurogenic as they require synaptic input from motor neurons to produce muscle contractions. A single motor neuron is able to innervate multiple muscle fibers, thereby causing the fibers to contract at the same time. Once innervated, the protein filaments within each skeletal muscle fiber slide past each other to produce a contraction, which is explained by the sliding filament theory. The contraction produced can be described as a twitch, summation, or tetanus, depending on the frequency of action potentials. In skeletal muscles, muscle tension is at its greatest when the muscle is stretched to an intermediate length as described by the length-tension relationship.

Unlike skeletal muscle, the contractions of smooth and cardiac muscles are myogenic (meaning that they are initiated by the smooth or heart muscle cells themselves instead of being stimulated by an outside event such as nerve stimulation), although they can be modulated by stimuli from the autonomic nervous system. The mechanisms of contraction in these muscle tissues are similar to those in skeletal muscle tissues.