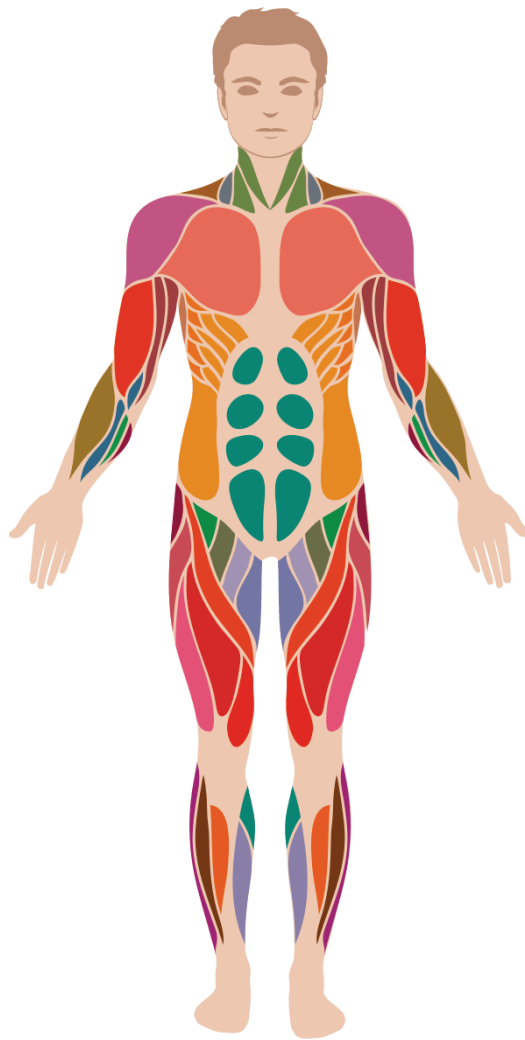


# LOCOMOTION AND MOVEMENT



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# LOCOMOTION AND MOVEMENT

## Locomotion and Movement

Movement is defined as the movement of living organisms from one place to another; if the movement causes a change in location or position, it is called locomotion; such as walking, climbing, running, etc.

## Kinds of Movement

There are three kinds of movement which are ciliary, amoeboid, and muscular.

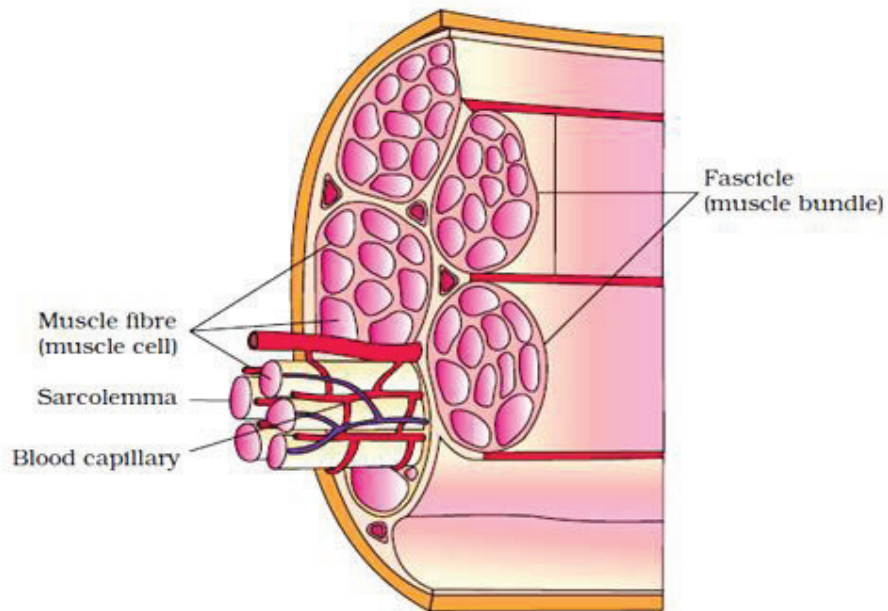
- **Ciliary Movement:** This type of movement occurs in those organs which are covered with ciliated epithelium. It helps to capture dust particles that are inhaled during breathing and also helps to move the egg from the fallopian tube into the uterus.
- **Amoeboid Movement:** This type of movement can be seen in some immune cells, such as macrophages and white blood cells. It can also be seen in amoeba moving through pseudopods.
- **Muscular Movement:** Muscle movement is seen in the tongue, chin, limbs, etc. The muscles, bones, and nervous system are all involved in locomotion.

## Muscles

Muscles are specialized tissues of mesodermal origin. They have property like excitability, contractility, extensibility and elasticity.

**There are three types of muscles:**

- **Skeletal muscle:** These are closely associated with the skeletal components of the body having a striped appearance when viewed under a microscope hence known as striated muscles. Primarily, these muscles are involved in the locomotory actions and the changes of the body posture.
- **Visceral muscle:** These are situated in the inner walls of the hollow visceral structures of the body such as the reproductive tract, alimentary canal etc and show no striations. As they appear smooth, they are referred to as smooth muscles. These involuntary muscles enable the transportation of food through the digestive tract and the movement of gametes through the genital tract.
- **Cardiac muscle:** These are the muscles of the heart, where the cells arrange in a branching pattern forming cardiac muscles. These are striated and involuntary in nature.
- **Fascia:** Skeletal Muscle is made up of muscles bundles (fascicles), held together by collagenous connective tissue called fascia.

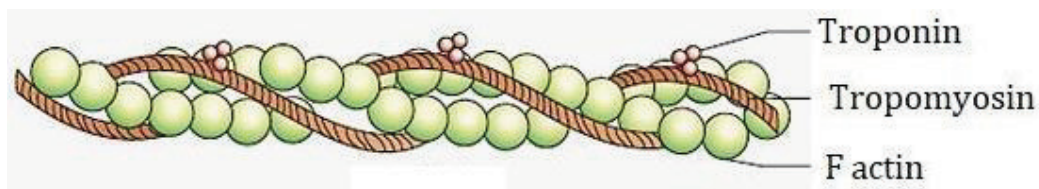


- Each muscle bundle contains a number of muscle fibres. Each muscle fibre is lined by plasma membrane called sarcolemma enclosing sarcoplasm. Partially arranged myofibrils are present in muscle bundle having alternate light and dark bands due to presence of protein- actin and myosin
- Light bands contain actin and is called I-band (isotropic band) and dark band contains myosin, called A-band (anisotropic band). Both bands are present parallel to each other in longitudinal fashion.
- In center of each I-band is elastic fiber called 'Z' line. In the middle of A-band is thin fibrous 'M' line. The portion of myofibrils between two successive 'Z' lines is the functional unit of contraction called a sarcomere.
- At resting stage thin filament overlaps the thick filament. The part of thick filament not overlapped is called 'H' Zone.

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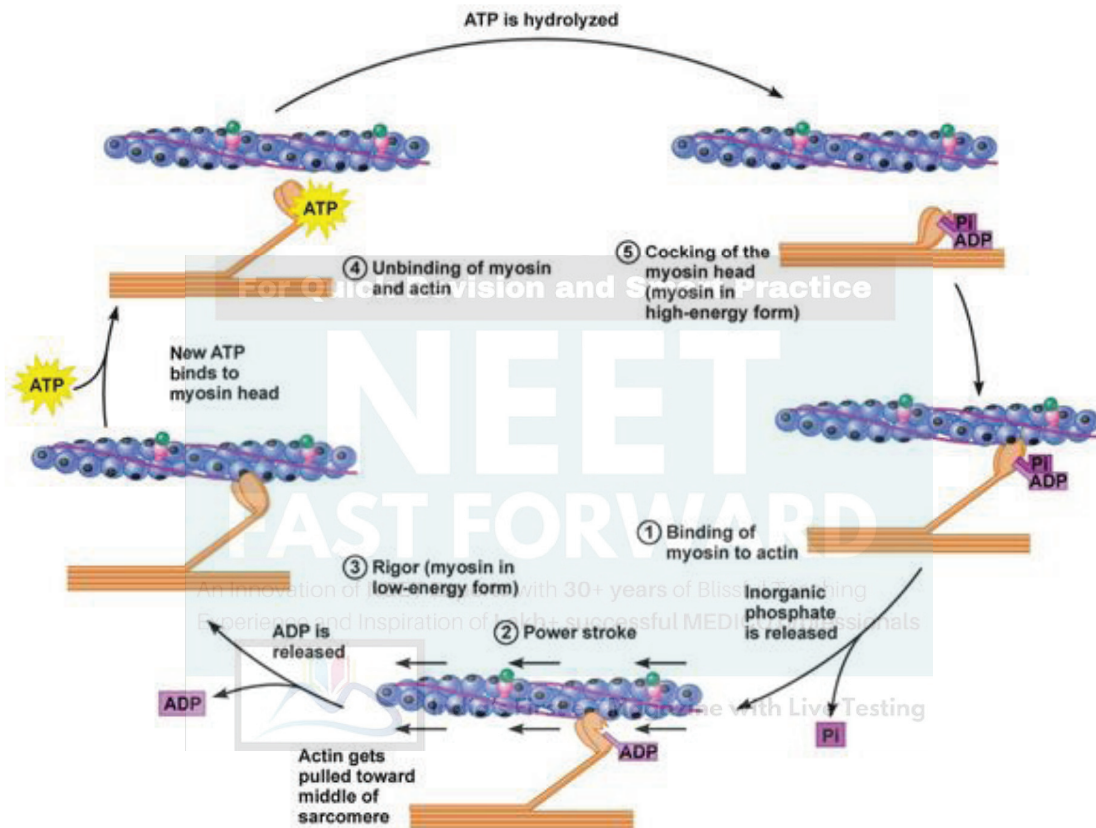
### Structure of contractile Protein

- Each thin filament (actin) is made of two 'F' actins helically wound to each other. Two filaments of another protein, tropomyosin runs close to it. A complex protein Troponin is distributed at regular intervals on the tropomyosin.
- Each myosin filament is made of many monomeric proteins called Meromyosins. Each meromyosin has globular head with short arm and tails. Globular head has ATP binding sites.



### Mechanism of muscle contraction

- The mechanism of muscle contraction is explained by sliding mechanism theory in which thin filament slide over thick filament.
- Muscle contraction start with signal sent by CNS via motor neuron. Neural signal release neurotransmitter (Acetyl choline) to generate action potential in the sarcolemma.
- This causes the release of  $\text{Ca}^{++}$  from sarcoplasmic reticulum.
- $\text{Ca}^{++}$  activates actin which binds to the myosin head to form a cross bridge.
- These cross bridges pull the actin filaments causing them to slide over the myosin filaments and thereby causing contraction.
- $\text{Ca}^{++}$  are then returned to sarcoplasmic reticulum which inactivate the actin. Cross bridges are broken, and the muscles relax.



### Muscles are classified as

- **Red fibres:** Red fibres (aerobic muscles-) contain myoglobin that has plenty of mitochondria to use large amount of oxygen stored in them.
- **White fibres:** White fibres the muscle fibres containing less number of myoglobin are called white fibres.

### Skeletal System

- Framework of bones and cartilage forms the skeletal system. In human beings, it consists of 206 bones and some cartilages.
- The two principle division of skeletal system are:
- Axial Skeleton (80 bones) includes skull, vertebral column, sternum and ribs



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