Department of biology

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(animal physiology)

Stage (-3-)

LEC- ((10))

Muscular System

By

Dr. Nadhema Bahaa Wetwet

Muscular System

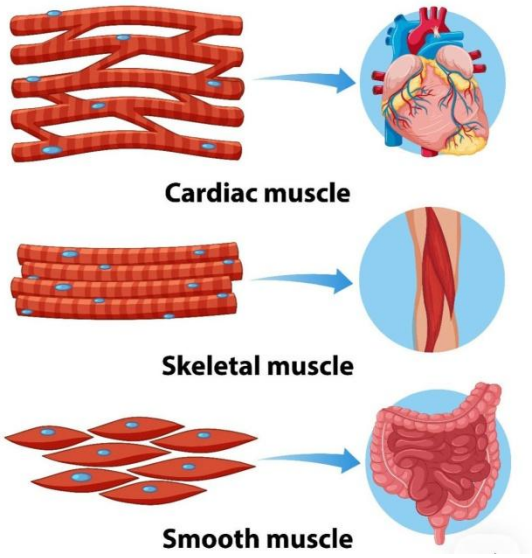
Nerves act on muscles to move the body and control bodily functions.

Types of muscles

A. **Skeletal:** Usually attached to bones; cause voluntary movement.

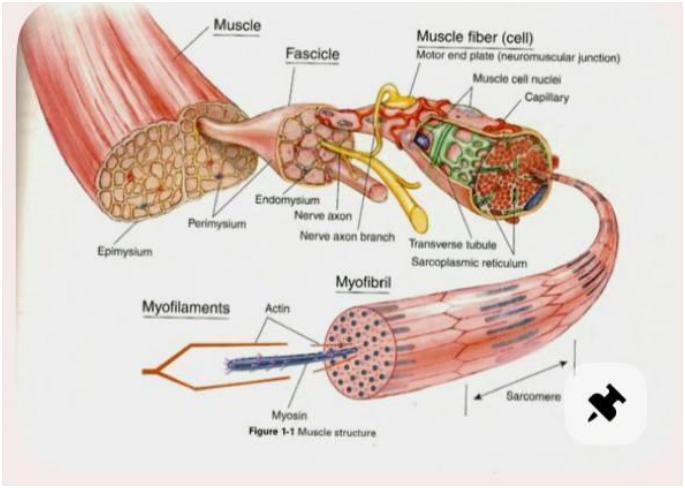
B. **Smooth:** Found in hollow organs; causes involuntary movement.

C. **Cardiac:** Found only in the heart; causes the heart to beat.



Skeletal Muscle

Skeletal muscles are called striated, because they are collections of muscle fibers, or cells. Skeletal muscle cells are very large and complex from 1mm to 30 cm long and have many nuclei.



Inside a Muscle Cell

– Inside a muscle cell, there filaments, thin and thick made of protein.

– The thin filament is called actin.

– The thick filament is called myosin.

– Myosin grips the actin and pulls it when the muscle contracts.

How do Skeletal Muscles Work?

Muscles do their work when the contract—that's why each muscle in your body has two sets, one to contract your arm or leg in one direction, and another muscle to contract and move it back. But, in order for the muscle to contract, special steps have to happen inside each cell.

Muscle Contraction: Sequence of Events

1. Motor nerve's impulse sent to neuromuscular junction.

2. Acetylcholine (ACH) released by motor neurons and attaches to receptors on sarcolemma.

3. Action potential (impulse) travels down T-tubules to sarcoplasmic reticulum (SR).

4. SR releases calcium (Ca+) into sarcomere through the sarcoplasm

5. Ca+ bonds to actin-troponin-tropomyosin complex **(freezes open actin binding site).**

6. Actin binding site uncovered and myosin binds to actin complex. Actin bonds to myosin heads.

7. ATP breakdown/splits (triggered by myosin bonding to actin), releasing energy. Ca+ req. for ATP release.

8. Impulse stops, Acetylcholinesterase breaks down ACH.

9. ATP used to pump Ca+ back to SR.

10. Tropomyosin covers binding sites, myosin no longer bound to actin.

11. Muscle relaxes.

Smooth Muscle

– Not under voluntary control

– Found in stomach, intestines, blood vessels, etc.

– Also, your diaphragm-the muscles which causes your lungs to expand and contract.

Cardiac Muscle

• Cardiac muscle is heart muscle – Striated but involuntary

– Always working

– All heart muscle cells have to contract at once, so a small patch on the heart tells

the cardiac muscles to contract.