

جامعة الانبار

كلية : الصيدلة

قسم : الصيدلة

اسم المادة باللغة العربية: بايولوجيا الانسان

اسم المدة باللغة الإنكليزية: **Human Biology**

المرحلة: الاولى

التدريسي: أ.م.د. مهند عبدالمجيد محمد

عنوان المحاضرة باللغة العربية: النسيج العضلي

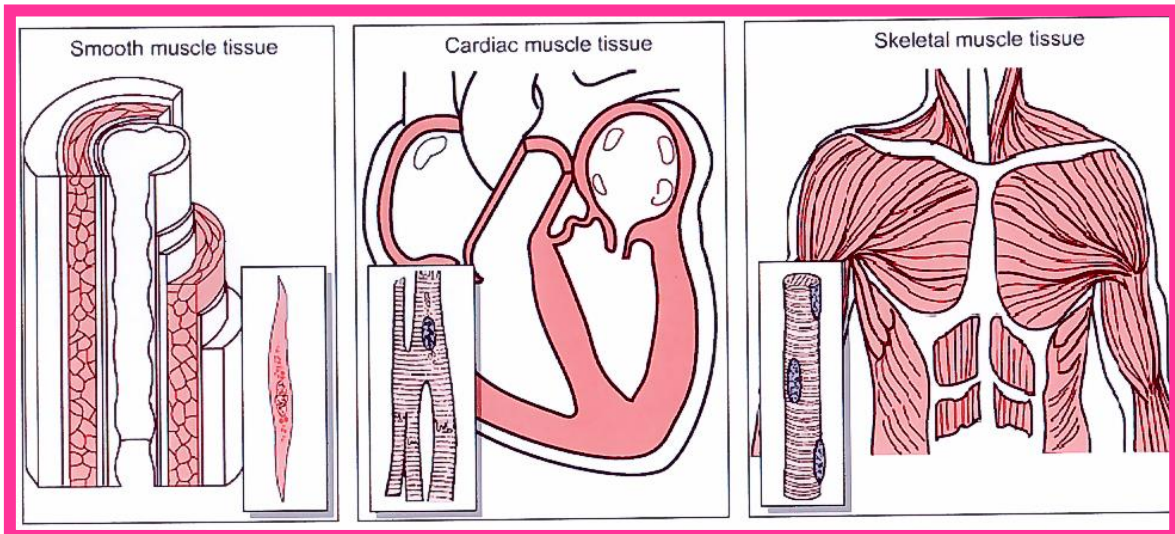
عنوان المحاضرة باللغة الإنكليزية: **Muscular Tissue**

محتوى المحاضرة:

(Muscular Tissue)

Muscle tissue is able to contract and relax, providing movement within the body and of the body itself. Muscle contraction requires an adequate blood supply to provide sufficient oxygen, calcium and nutrients and to remove waste products.

There are three types of specialized contractile cells, also known as fibers: **skeletal muscle, smooth muscle and cardiac muscle**. Components: cell: muscle fiber-myofiber, elongated thread-liked, Sarcolemma, Sarcoplasm.

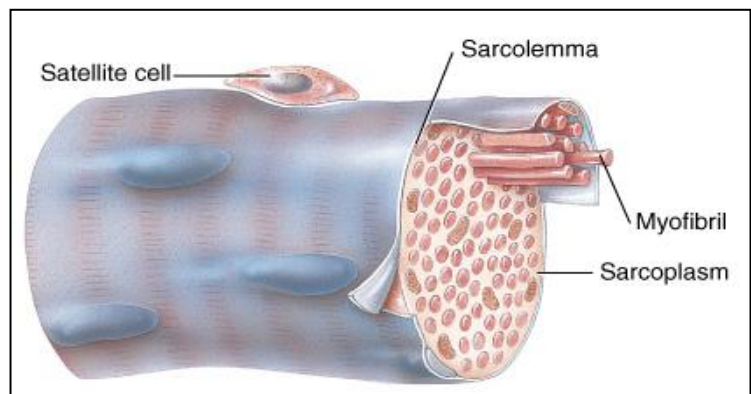


Characteristics of Muscle Tissue

- **Contractility**
 - Muscle tissue shortens producing force.
 - “Muscles can only contract!”
- **Excitability**
 - Responds to nerve impulses by contracting.
- **Extensibility**
 - Can be stretched by outside force (such as by another muscle).
- **Elasticity**
 - Recoils after being stretched

Muscle Fiber or Myofibers

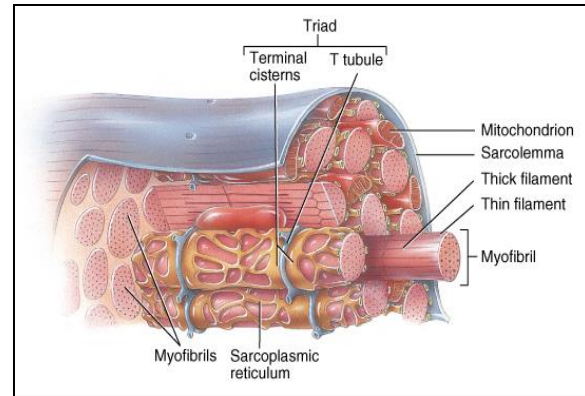
- **Muscle cells are long, cylindrical & multinucleated**
- **Sarcolemma = muscle cell membrane**
- **Sarcoplasm filled with tiny threads called myofibrils & myoglobin (red-colored, oxygen-binding protein)**



Transverse Tubules

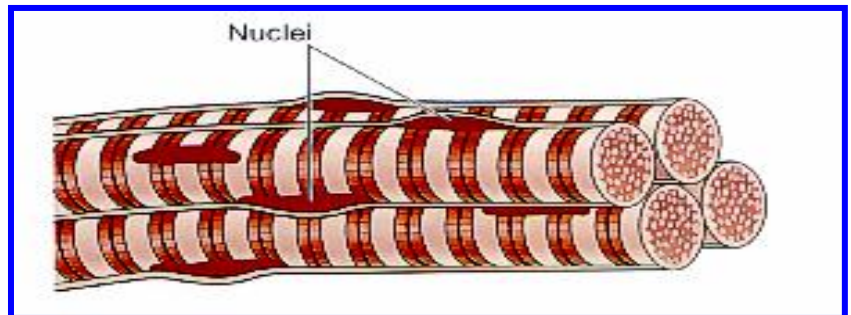
- **T (transverse) tubules** are invaginations of the sarcolemma into the center of the cell

- filled with extracellular fluid
- carry muscle action potentials down into cell
- **Mitochondria** lie in rows throughout the cell
 - near the muscle proteins that use ATP during contraction




1. Skeletal muscle:

This type is described as skeletal because it forms those muscles that move the bones [of the skeleton]. Striated because striations (stripes) can be seen on microscopic examination. Voluntary as it is under conscious control. In reality, movements can be finely coordinated, e.g. writing, but may also be controlled subconsciously. For example, maintaining an upright posture does not normally require thought unless a new locomotor skill is being learned, e.g. skating or cycling, and the diaphragm maintains breathing while asleep.



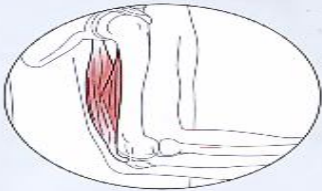
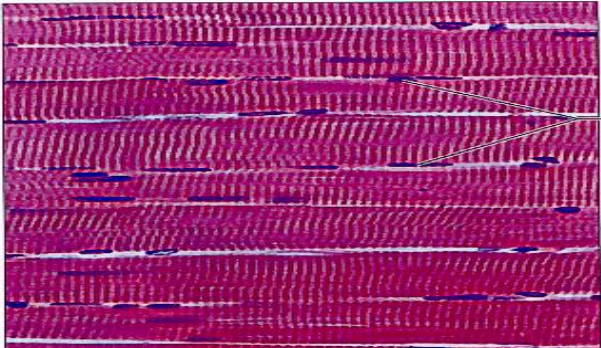
(a) Skeletal muscle

Description: Long, cylindrical, multinucleate cells; obvious striations.



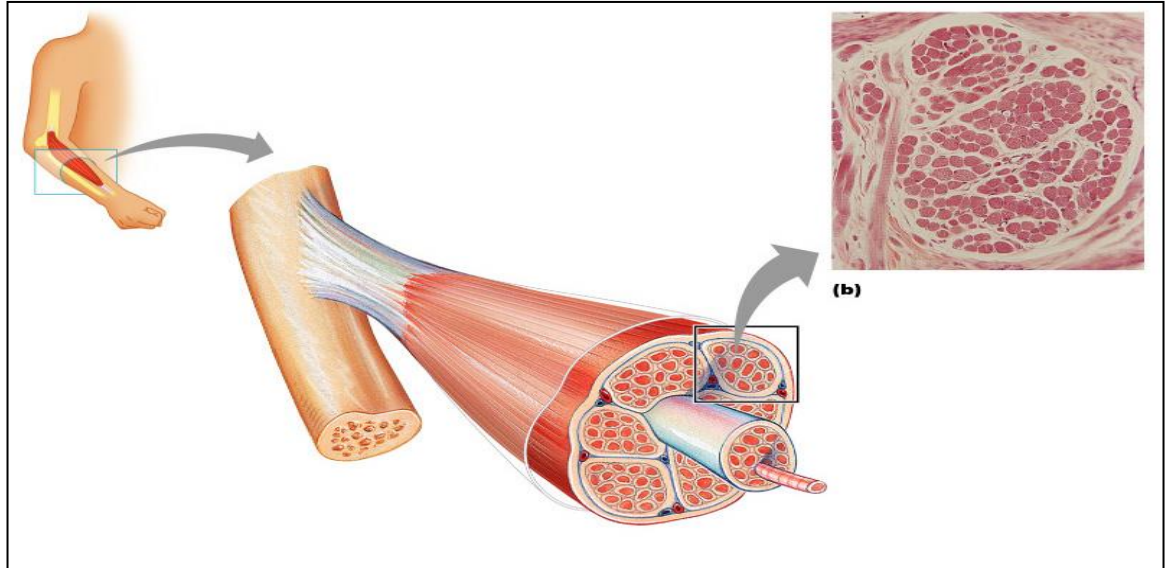
Function: Voluntary movement; locomotion; manipulation of the environment; facial expression; voluntary control.

Location: In skeletal muscles attached to bones or occasionally to skin.

Photomicrograph: Skeletal muscle (approx. 300 \times). Notice the obvious banding pattern and the fact that these large cells are multinucleate.

Muscle is an organ consists of muscle fiber and connective tissue, fixed on bone by tendons, connective tissue: **Epimysium**: dense connective tissue, **Perimysium** and **Endomysium**.

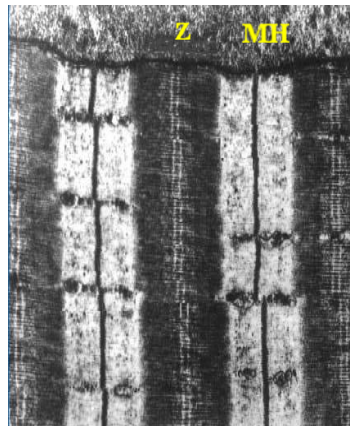


Muscle satellite cell: Differentiate and proliferate. Function: supporting, connecting, nourishing and regulating

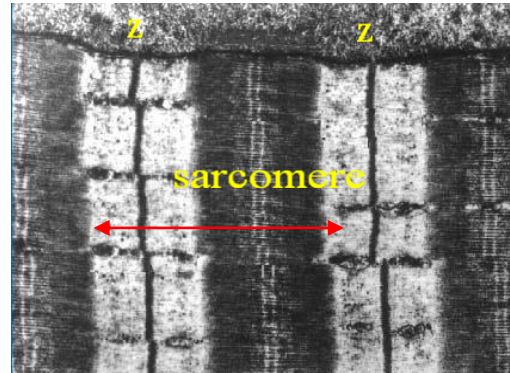
1) Microstructure of skeletal muscle fiber: Long cylindrical, multinucleate, nuclei are ovoid, distributed under sarcolemma and filled with longitudinal parallel-arranged myofibrils.

Myofibril: cross striation: light band-I (isotropic) band, dark band- A (anisotropic) band

- ❖ A band: M-line, H-band
- ❖ I band: Z-line

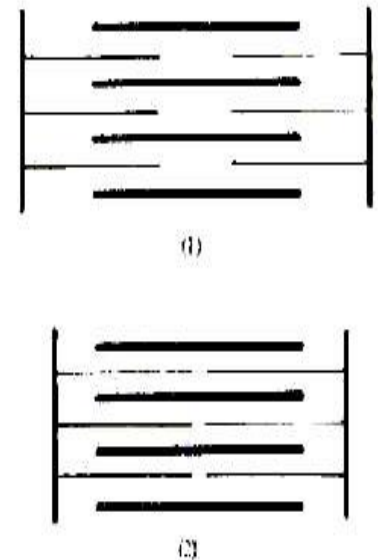


Sarcomere: a segment of myofibril extending from one Z line to next Z line, which is composed of 1/2 I band, A band and 1/2 I band, is the smallest structural and functional unit of myofibril.



Sliding filament hypothesis:

In relax the muscle in rest see (1). During the contraction, the A band remained constant in length, whilst the I band and H band both decreased in width, which suggest that the actin filament slide along the myosin toward the M –line see (2).

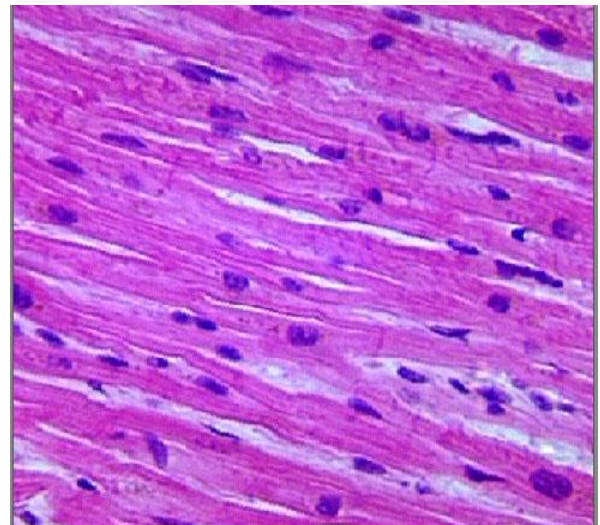
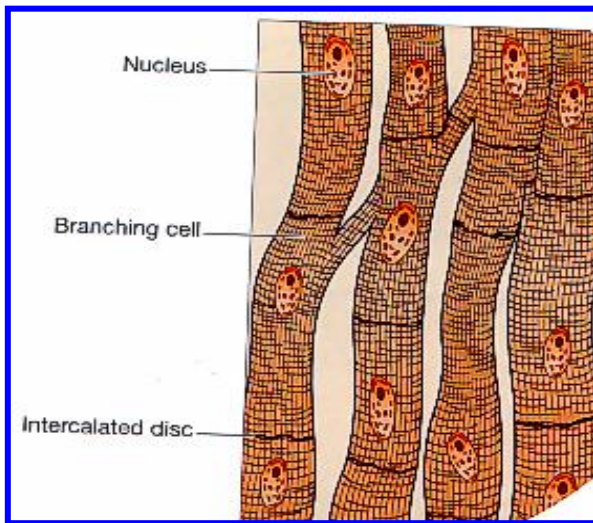


2. Cardiac muscle:

Structure of cardiac muscle:

Short column in shaped, with branches, the branches associated with each other to form a network. 1-2 ovoid nuclei, centrally-located. Striated, but no very clear. Intercalated disc: junctional part

Light Microscope: Dark striation across the cardiac fibers

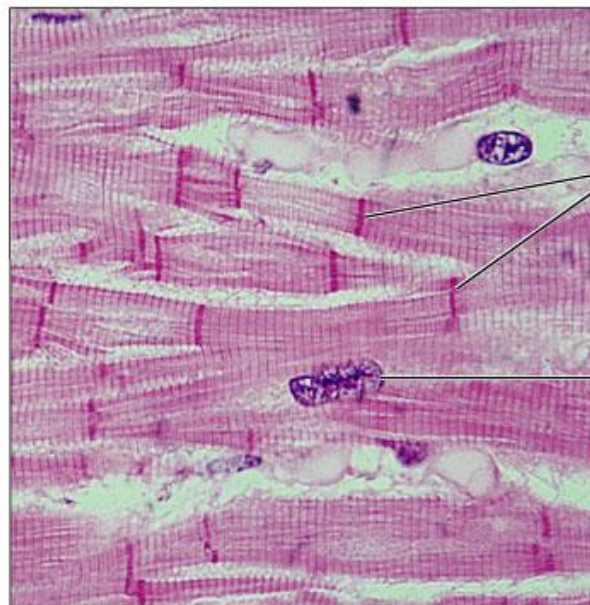
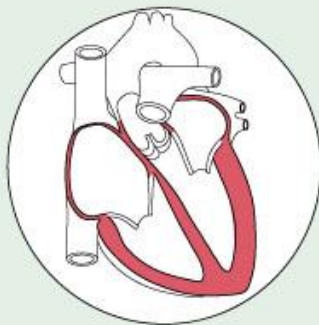


(b) Cardiac muscle

Description: Branching, striated, generally uninucleate cells that interdigitate at specialized junctions (intercalated discs).

Function: As it contracts, it propels blood into the circulation; involuntary control.

Location: The walls of the heart.



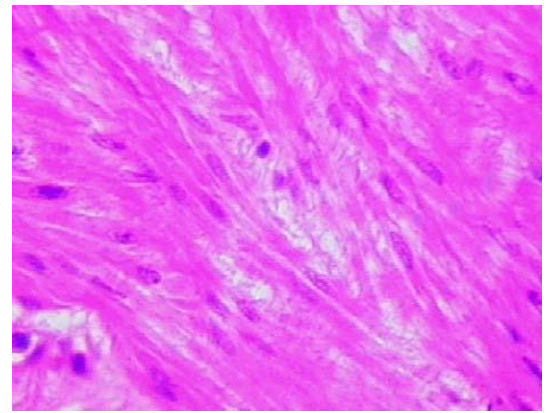
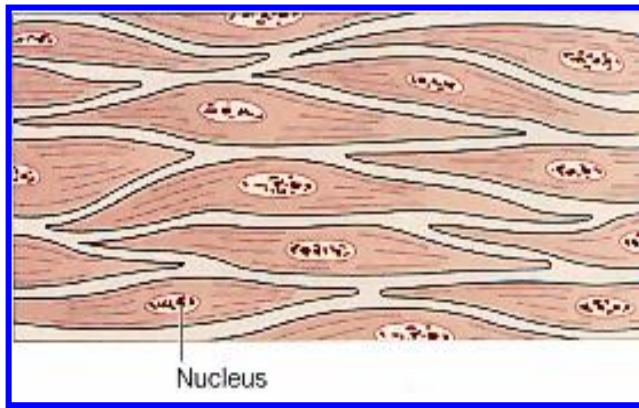
Photomicrograph: Cardiac muscle (800 \times); notice the striations, branching of cells, and the intercalated discs.

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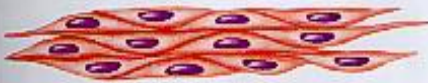
3. Smooth muscle:

Structure of smooth muscle:

Elongated, spindle-shaped cells, 8 μ m in diameter, 200 (20-500) μ m long. Rob-liked or ovoid nucleus, no striation and no myofibril.

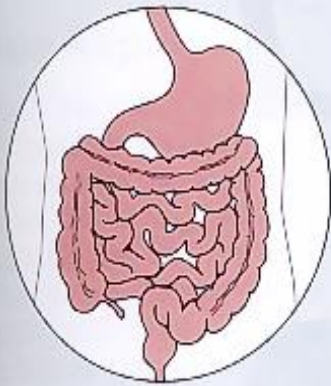


Description: Spindle-shaped cells with central nuclei; no striations; cells arranged closely to form sheets.



Function: Propels substances or objects (foodstuffs, urine, a baby) along internal passageways; involuntary control.

Location: Mostly in the walls of hollow organs.



Smooth muscle cell
Nuclei

Photomicrograph: Sheet of smooth muscle (approx. 600x).