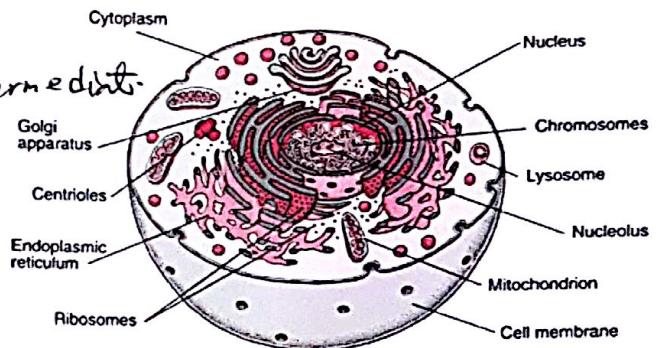


Tissue

- A cellular organizational level intermediate between cells and a complete organism.



- Two main components

1. Cells

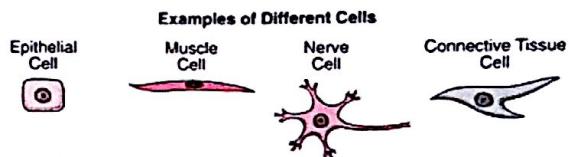
2. Extracellular Matrix ECM.

a space-filling material between cells.

~~the~~ a volume ratio of ECM to cells.

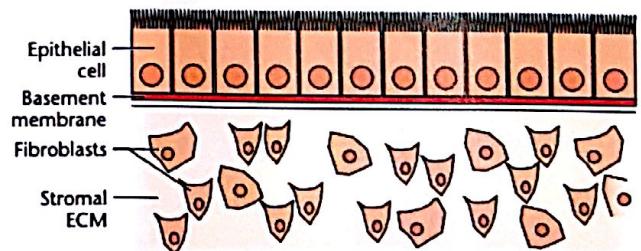
in muscle: 1:10. → Cells are predominant in mechanical behaviors in muscle)

in tendons, cartilages, and bone: 10:1



- ECM Functions

Previously known as an inert ground substance



- to fill space between cells.
- to provide a barrier that isolates tissues from other tissues.
- to provide a navigational cues for migratory cells.
- to provide signals that alter cell behavior, to sequester active compounds such as growth factors.

- Two main forms

Basement membrane: thin layers separating the epithelium from the connective tissue (stromal matrix)

Stromal matrix: (fibrous). → in load-bearing tissues such as, artery walls, tendons, cartilage, skin. Some stromal matrix is mineralized to produce bone.

- Molecular composition

ECM is composed mainly of glycoproteins and proteoglycans, many of which are able to bind to specific sites on other ECM glycoproteins so that the matrix becomes a highly crosslinked gel

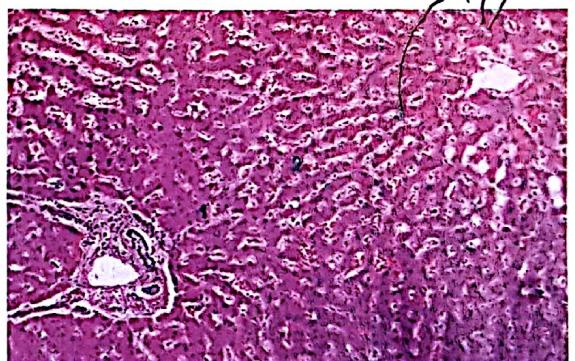
H&E

- dark blue, violet.
- DNA, RNA
- Red, pink
most protein in cytoplasm.

by hematoxylin
purple

Histology

: The study of tissue, especially their structure and arrangement



Liver

Pathology

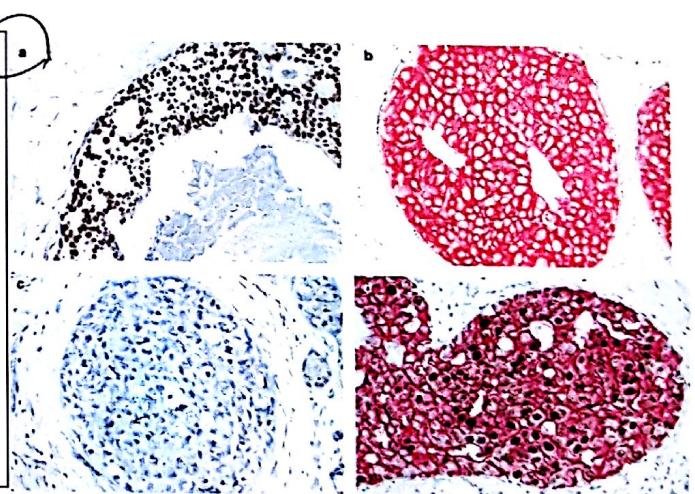
: The study of the causes and effects of diseases, diagnostic or forensic purposes

Hisopathology

: The microscopic examination of biological tissues to observe the appearance of diseased cells and tissues in very fine detail

Examples of DCIS double immunostained for ER and HER2 protein. ER expression is denoted by brown nuclear staining and HER2 overexpression is represented by red staining of the cell membrane.

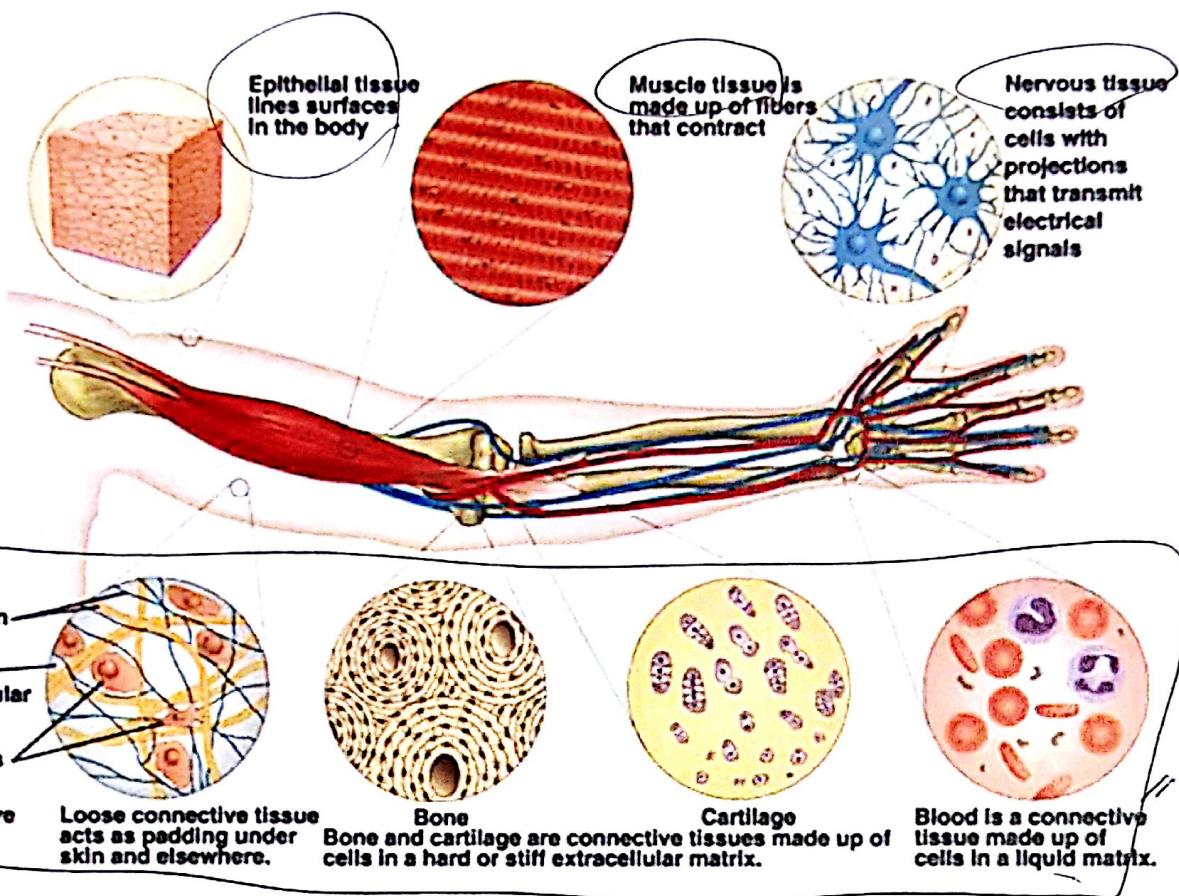
- ER-positive/HER2-negative
- ER-negative/HER2-positive
- ER-negative/HER2-negative
- ER-positive/HER2-positive.



Ductal carcinoma in situ of the breast.

IHC.

Four types of Tissue

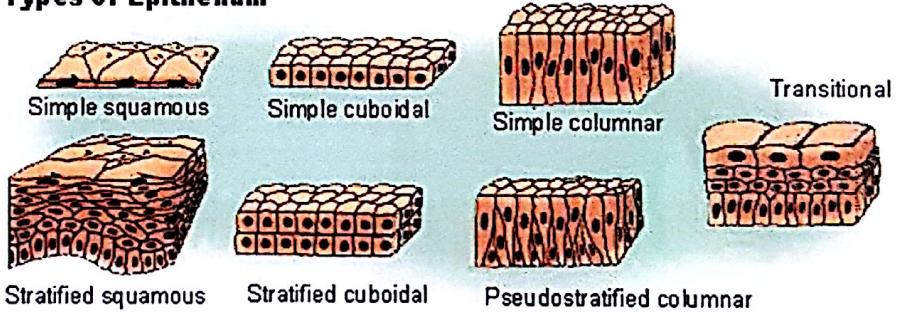


- **Epithelium**

A sheet-like layer of cells

hair, finger nails
toenails, feathers, hooves

Types of Epithelium



Function:

1. **Protection**: sunlight, heat, cold, abrasion - [Stratified keratinized (water proof)]
2. **Selective diffusion**: transfers of gases, nutrients, waste products between blood and surrounding tissues.
3. **Absorption**: absorption of nutrients from intestine.
4. **Secretion**: secretion enzymes for digestion.

- Connective tissue

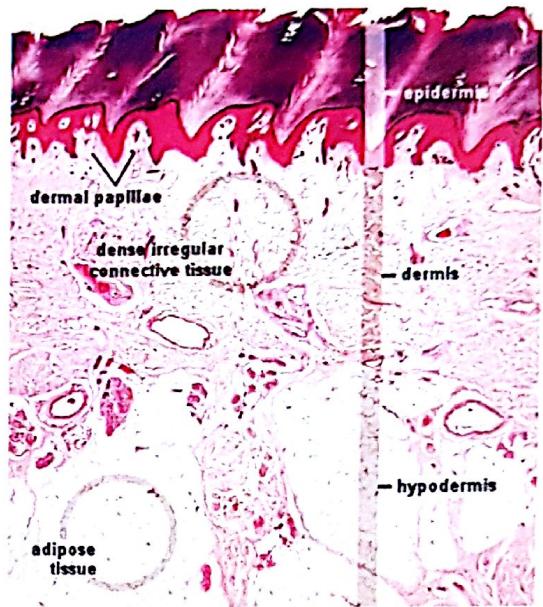
Most abundant tissue type in the body

Possessing a great blood (not tendons, ligaments, and cartilages)

Various properties based on the amount, type, and arrangement of ECM (fiber, proteoglycans, glycoproteins)

Function:

1. filling between organs and tissues
2. metabolic support - nutrients.

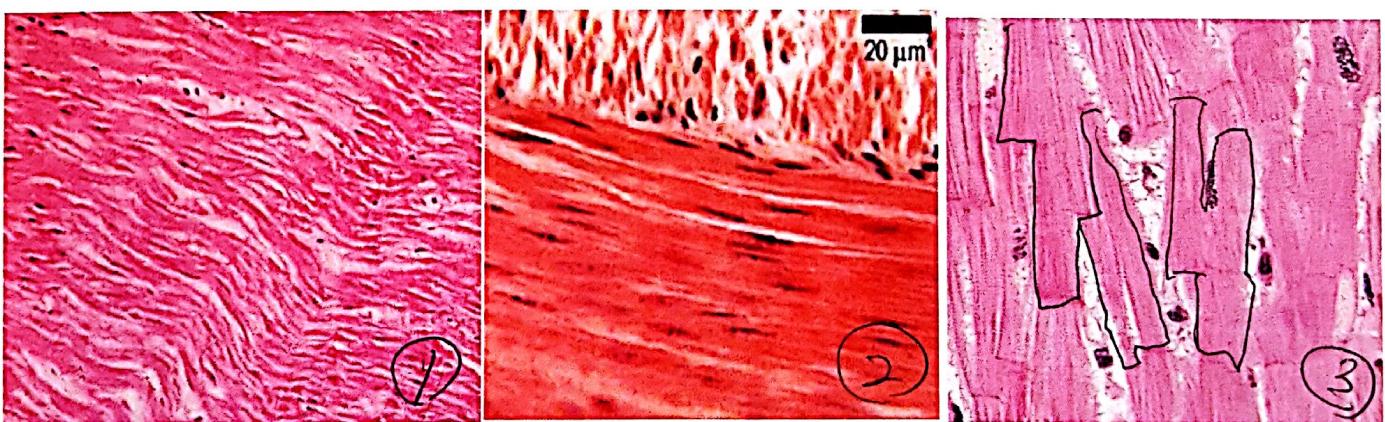


3. Structural support

Many specialized types

Tendons. ligaments, cartilage. adipose tissue. blood. bone, skin, lymph.
etc...

- Muscular tissue



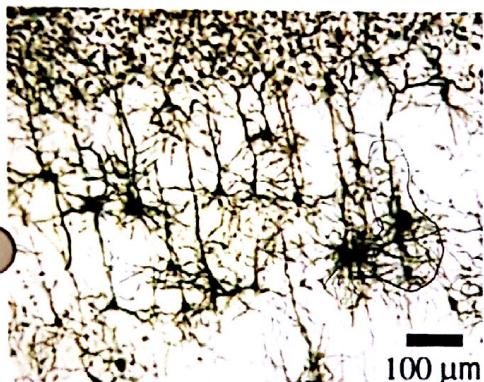
Function:

1. Body movement.
2. move blood, food, wast through body's organs
3. Mechanical digestion

Type:

1. Smooth muscle (involuntary) - inferal organ walls, blood vessel walls
2. Skeletal muscle (voluntary.) - large, striated muscle packed in bundle
3. Cardiac muscle (involuntary) - only walls of the hearts, striated, ~~thin~~ and branched.

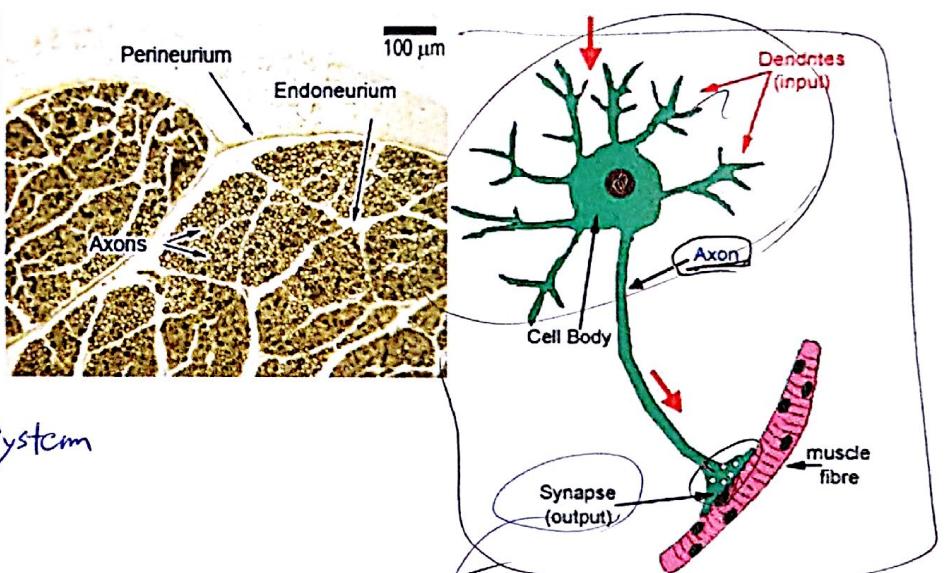
- Nervous tissue



Central neurons system

Brain, spinal cords, nerves

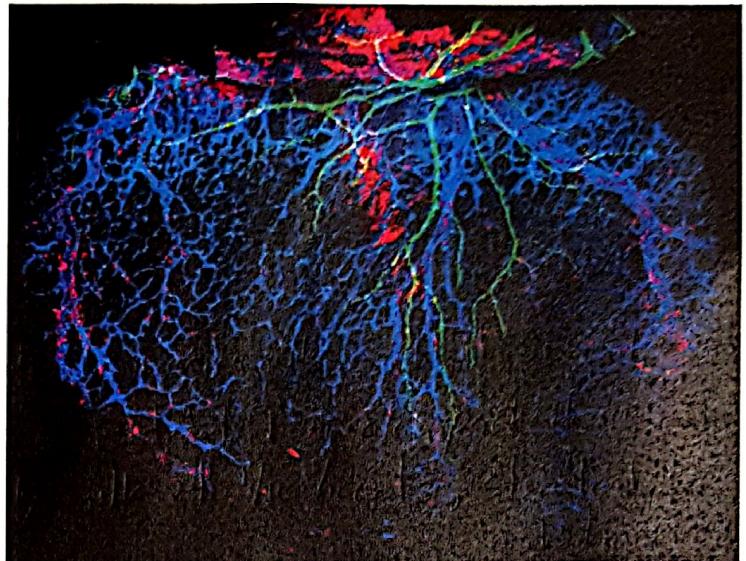
: Specialized to ~~transit~~ transmit electrical impulses to other ~~neuro~~ nerve cells, muscle, or glands via neurons.



Axon : 1m in length
max & 0.2-20 μm in diameter

specialized neuronal junction
{ neurons - neurons ?
or neurons - muscle }

Cardiac sympathetic axons
subepicardium of the ventricular
wall of the developing mouse heart



Next week

We will look at the soft tissue from an engineering point of view

Soft tissue

:

Structural Properties

- 1.
- 2.
- 3.