

Introduction to histology

(Cell membrane)

BY

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Historical:

- Histology is the science of microscopic anatomy of cells and tissues.
- In the Greek language Histo=tissue, Logy= study (science).
- It is tightly bounded to molecular biology, genetics, immunology, and other basic sciences.
- The term (tissue) was first coined by the French "Bichat" and came into usage in the English language in the late 1700s.
- It's important to mention that all "Bichat's" work was done without a microscope.
- In 1838 **Schleiden & Schwann** suggested that all plant and animal tissues are composed of **cells**.
- Further studies revealed that these cells contained smaller structures in their cytoplasm.

Units used in microscopy:

- One Millimeter = 1000 micrometer (μm).
- One μm = 1000 nanometers.

OR

- One μm = 0.001 millimeter.
- One nanometer = 0.001 μm .

Histology is studied using two types of microscopy:

- 1- Light Microscope (L.M)
- 2- Electron Microscope (E.M)

- ✓ The study of biological tissue is called histology.
- ✓ It is also known as microanatomy because it involves studying plant, animal and human tissue under a **light microscope** or an **electron microscope**.

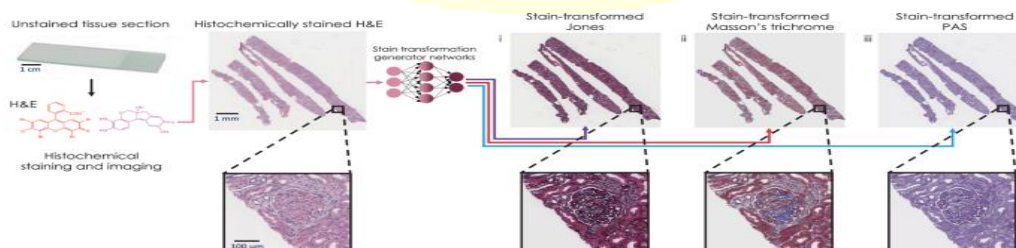
Histology is the study of the tissues of the body and how these tissues are arranged to constitute organs.



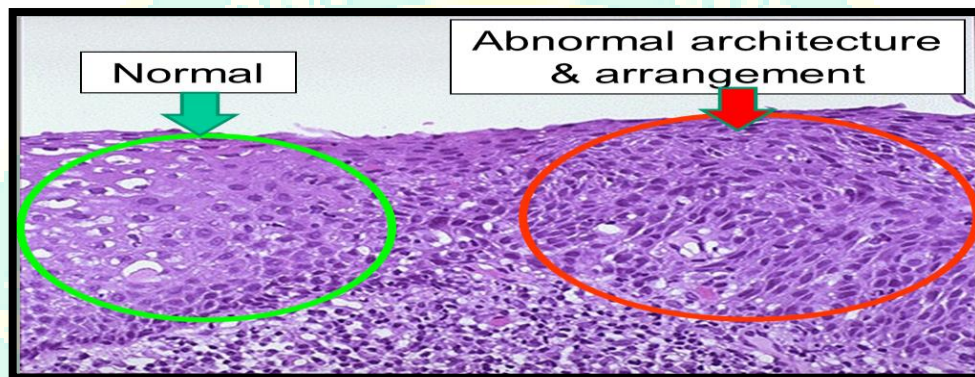
Histology is a branch of the main science of biology dealing with the microscope and ultrastructure of all body tissues and cells in accordance with the organs and system.



-A thin slice of tissue is placed under the microscope and examined after staining. Staining helps in distinguishing various biological structures more easily and accurately. The colors enhance certain types of these structures that may be located next to/in contact with each other. It helps see deviations in a clearer way.



- Therefore, histology deals with microscopic structures that are not visible to the naked eye at the cell level.
- One of the benefits of histology is **to distinguish between healthy cells (normal cells) and abnormal cells.**



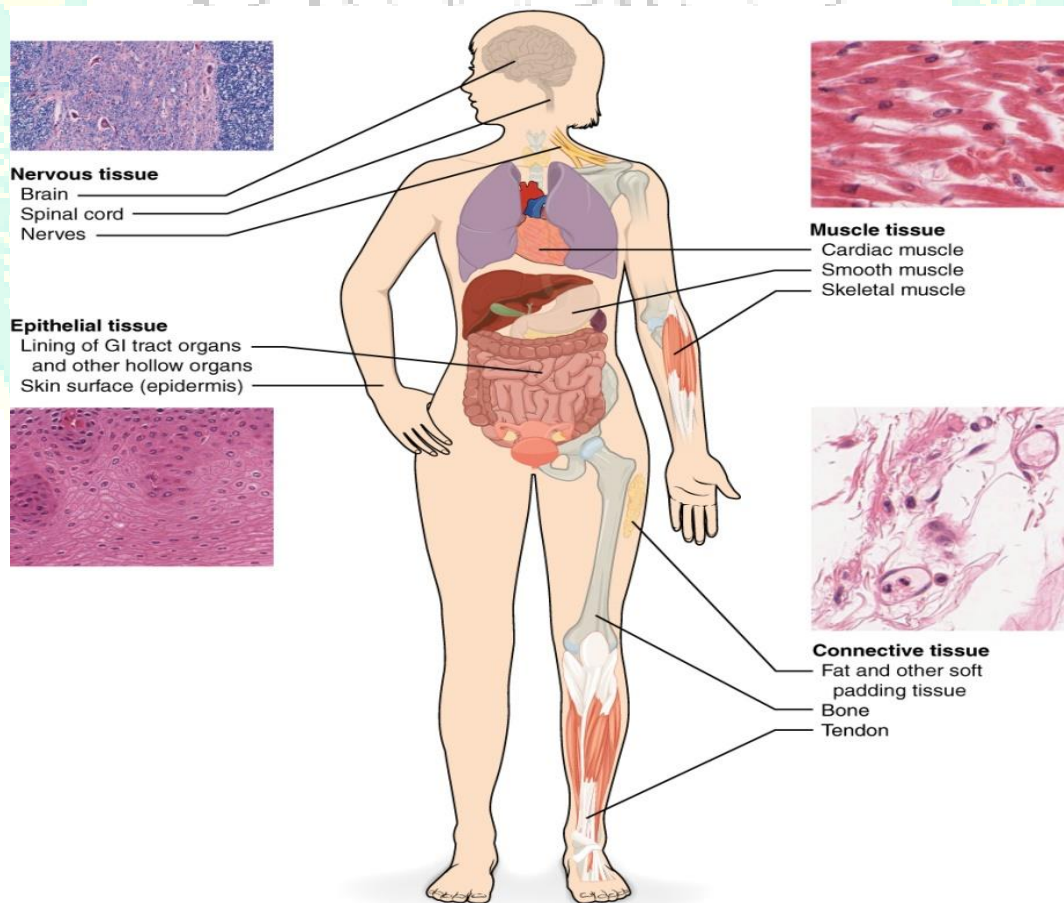
EVOLUTION OF CANCER

Micro technique:

- ❖ Micro technique = tissue preparation for microscopic examination.
 - ❖ There are different methods used, however, the basic principles are similar.
 - ❖ It usually involves **hardening** of the tissue followed by section (**cutting**).
1. **Paraffin technique** (The most commonly used technique in a histology laboratory)
 2. **Frozen sections.**

Types of Tissue:

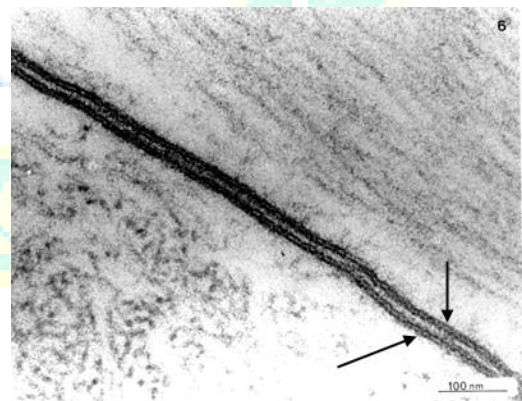
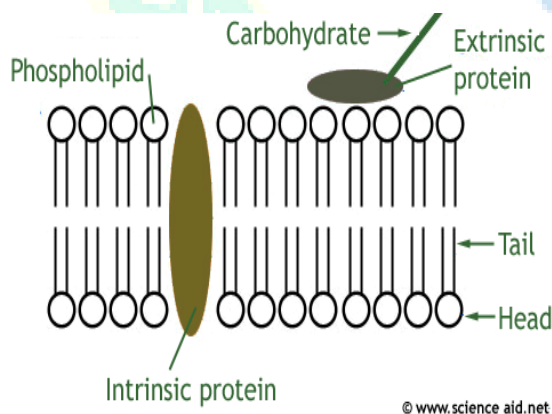
- 1- **Epithelial tissue:** refers to groups of cells that cover the exterior surfaces of the body, line internal cavities, and passageways, and form certain glands.
- 2- **Connective tissue:** as its name implies, binds the cells and organs of the body together.
- 3- **Muscle tissue:** contracts forcefully when excited, providing movement.
- 4- **Nervous tissue:** is also excitable, allowing for the generation and propagation of electrochemical signals in the form of nerve impulses that communicate between different regions of the body.



Cell membrane

The **plasma membrane** (**plasma lemma**, **limiting membrane**) that envelops every eukaryotic cell consists of lipids, cholesterol, and proteins.

- ❖ The type of lipid present in the cell membrane is **Phospholipids**; it is the main component of the cell membrane.
- ❖ The cell membrane is not visible under the light microscope because it is **very thin** and, can be seen under the electron microscope with special pigments (staining).
- ❖ The cell membrane is visible by a dye called **Osmium Tetroxide (O.T)**.
- ❖ Plasma lemma is thickness 7.5 – 10 nm and consists of Trilaminar (2 electron-dense and 1 electron-lucent in between).



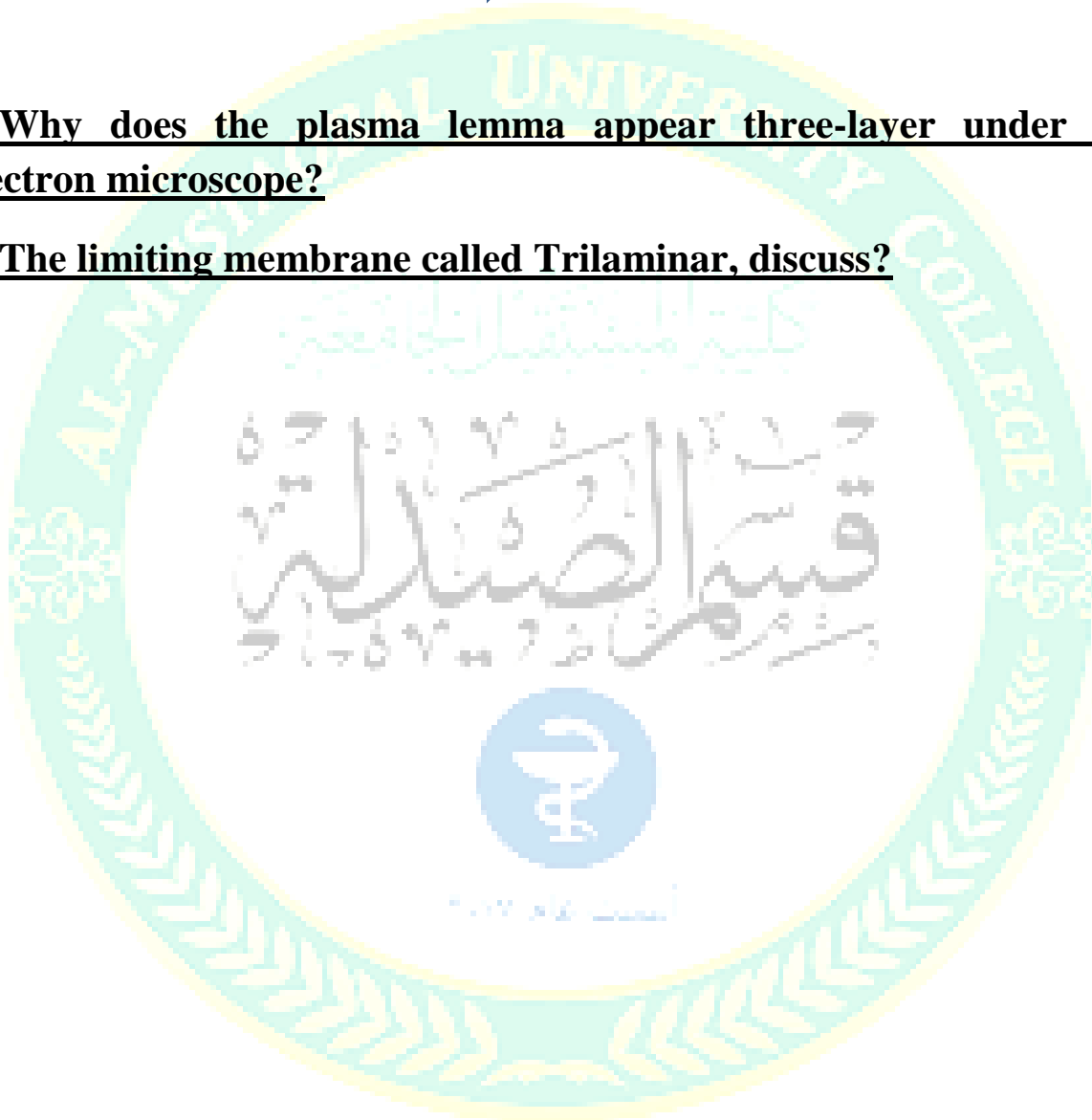
❖ The heads are **hydrophilic** While, the tails are **hydrophobic**

2 electron-dense  Head (Black)

1 electron-lucent  Tail (White)

Q/Why does the plasma lemma appear three-layer under the electron microscope?

Q/The limiting membrane called Trilaminar, discuss?



Common Histological Stains

Reagent	Results
1. Hematoxylin	Blue
2. Eosin	Pink
3. Osmium Tetroxide (O.T)	Black
4. Masson's trichrome	Dark blue Red Light blue
5. Orcein	Brown
6. Silver stain	Black
7. Iron Hematoxylin	Black
8. Periodic acid Schiff (PAS) technique	Magenta

Histology is used to investigate various types of tissues:-

1. Examines the contents of the tissue.
2. Histology can also be used to investigate agricultural land, for example, in order to observe chemicals that can be found in the soil.
3. Histology is also used for autopsies.

There are many histology services, including neuropathological histology. This field investigates nerves to find diseases, nerve damage, and the like. A histological examination can confirm a diagnosis.

Other examples of histology services are:

1. Autopsy
2. Histology of special species (fish, birds, etc.)
3. Plastic injection for neurotoxic studies
4. Histological and toxicological pathology
5. Reproductive and fetal pathology
6. Molecular pathology