**General Histology** 

Lecture 23 (3<sup>rd</sup> week/Lecture 1)

#### **Block 102PMS**





# Prof. Dr. Sohair A Eltony

By

Histology Department, Faculty of Medicine, Assiut University (2021-2022)

# **Epithelial Tissue**

Characteristic features & basement membrane

# **Learning objectives**

## After this lecture, students should be able to:

- List the basic types of tissues in the body.
- Discuss the characteristic features of epithelium.
- Define the basement membrane and mention its structure & functions.

### **References:**

 USMLE Step 1 Lecture Notes 2020. KAPLAN MEDICAL. Part I Chapter 3. Pages: 13, 14 & 16.

## **Introduction:**

- The organs of the human body are composed of <u>four basic</u> <u>tissue types:</u> epithelial, connective, muscular and nervous.
- Each tissue contains cells as well as extracellular matrix, associate with one another in the variable proportions and morphologies characteristic of each organ.

### ➤ Main characteristics of the four basic types of tissues:

Tissue	Cells	Extracellular matrix
<b>Epithelial</b>	Aggregated cells	Small amount
Connective	Fixed and wandering cells	Abundant amount
Muscle	Elongated contractile cells	Moderate amount
Nervous	Elongated cells with fine processes	Very small amount

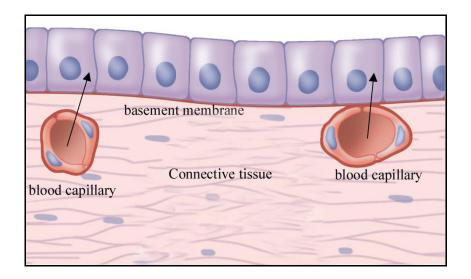


**Epithelia** (Gr. epi, upon +thele, nipple)

# Characteristic features of epithelial cells

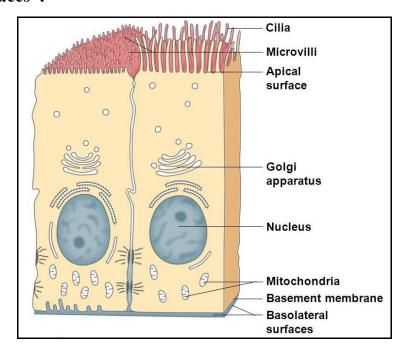
- 1. Epithelial tissues are composed of closely aggregated cells, forming cellular sheets that lines the cavities of organs, cover the body surface or form clusters of cells as in glands.
- 2. The shapes of epithelial cells are variable (squamous, cuboidal, columnar) with nuclear shape corresponding roughly to cell shape.

- 3. Adjacent epithelial cells are adhering strongly to one another by cellular junctions.
- 4. The basal surface of all epithelia rests on a thin extracellular sheet "the basement membrane".
- 5. Epithelia <u>do not</u> themselves normally contain blood vessels "avascular".
- 6. Most epithelia are adjacent to connective tissue containing blood vessels from which the epithelial cells receive nutrients.

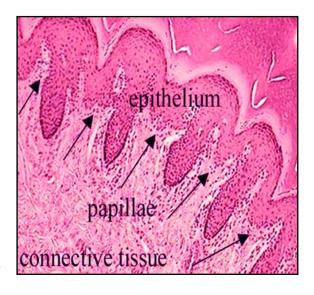


7. Epithelia which are formed of one cell layer (simple epithelia) generally show "polarity", with organelles and membrane proteins distributed unevenly within the cell. The region of the cell contacting the connective tissue is called the "basal pole" and the opposite end, is the "apical pole", with the two poles differ significantly in both structure and function. Regions of cuboidal or columnar

cells that adjoin neighboring cells comprise the cells "lateral surfaces".



- 8. The connective tissue that underlies the epithelia lining the organs of the digestive, respiratory & urinary systems is called the "lamina propria".
- 9. The area of contact between the epithelium and connective tissue may be increased by small invaginations called "papillae" projecting from the connective tissue into the epithelium. Papillae occur most frequently in epithelial tissue subject to friction such as the covering of the skin or tongue.



### 10. The principal functions of the epithelial tissues include:

- Protection (eg, epidermis).
- Absorption (eg, intestinal lining).
- Secretion (eg, glands).
- Contractile (eg, myoepithelium).
- Sensory (eg, taste buds).

## **Basement membrane**

<u>Definition:</u> Is a thin extracellular sheet of macromolecules between the basal surface of epithelia and the underlying connective tissue.

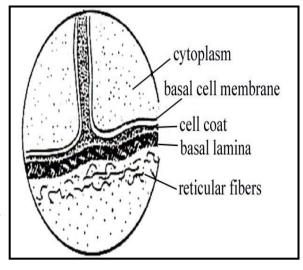
### **Structure:**

- ➤ With the light microscope, the components in this structure can be stained with <u>PAS</u> (glycoproteins in the basal lamina) and <u>silver stain</u> (reticular fibers in the reticular lamina).
- ➤ With the transmission electron microscope, it is composed of two parts. Nearest the epithelial cells is an electron-dense layer, the <u>basal</u> <u>lamina</u> and beneath this layer is a fibrous <u>reticular lamina</u>.

The basal lamina contains glycoproteins and type IV collagen secreted from the basal sides of the epithelial cells.

The basal surface of the epithelial cells adheres strongly to the basal lamina by "hemidesmosomes".

The reticular lamina contains reticular fibers (type III collagen) and is bound to



the basal lamina by anchoring fibrils of type VII collagen, both of which are produced by cells of the connective tissue.

### Functions of basement membrane:

- 1- Provides structural support for epithelial cells; attach epithelia to underlying connective tissue.
- 2- Acts as filter of diffusing macromolecules (e.g, in the kidney).
- 3- Maintains cell polarity.
- 4- Permits the flow of nutrients, as epithelium is avascular.
- 5- Controls epithelial growth & differentiation. It forms a barrier to downward epithelial growth. This is only breached in malignancy.

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### ASSESS YOUR KNOWLEDGE

#### **Choose the correct answer:**

#### 1. Epithelial cells rest:

- a. On a basement membrane.
- b. On a cartilage.
- c. Directly on a connective tissue layer.
- d. On a bony surface.

#### 2. Epithelial tissues have:

- a. Numerous blood vessels.
- b. Widely separated cells.
- c. Abundant extracellular matrix.
- d. Closely aggregated cells.

### 3. Functions of the basement membrane include which of the

### Following?

- a. Contractility.
- b. Modification of secreted protein.
- c. Molecular filtering.
- d. Active ion transport.