

# Histology: Lecutre (1), Part (1):

## Slide (1):

-Histology stands “as a term” for: Science of Tissues since Histo- means Tissue.

-Tissue: is Groups of similar cells and extracellular products that carry out a common function.

-The tissues in our body are divided into (4) primary types, and each type has it's very own characteristics:

I-Epithelial Tissue. II-Connective Tissue.

III-Muscle Tissue. IV-Nervous Tissue.

-These common functions can be seen as:

1-Providing Protection (Epithelial and Connective).

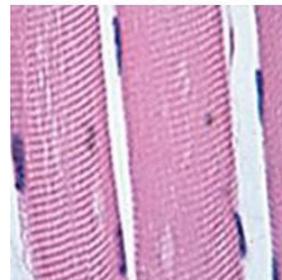
2-Facilitate Body Movement (Nervous and Muscular).

## 4 Basic Types of Tissues

-cells are very far from each other with a lot of space.  
-Nucleus are seen in a very low amount.



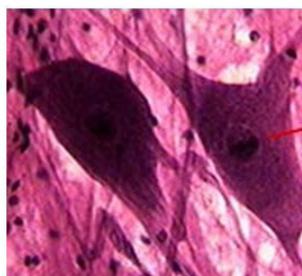
Connective tissue



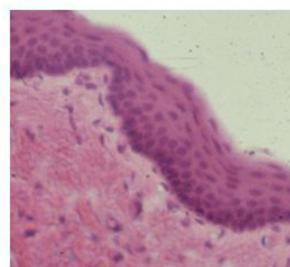
Muscular tissue

-Capable of contraction.

-Neuron (Nerve Cell) + Supporting Tissue.



Nervous tissue



Epithelial tissue

-Cells are Very Close to each other without spaces.  
-Nucleus are seen in a very high amount.

## Slide (4):

-Epithelial tissue covers or lines every body surface and body cavity.

-Epithelium is composed of one or more layers of closely packed cells between two compartments "The outer surface with the connective tissue beneath".

\*Characteristics of the Epithelial Tissue:

-Closely aggregated cells.

-Very little intercellular substances "Which indicates that there are no spaces between them".

-Derived from 3 embryonic layers.

-Regular shaped cells bind together by junction coesmplex.

-Resting on basal lamina (basement membrane).

-Avascular "No blood vessels".

-Rich in nerve supply.

-High renewal rate "For instance, in cases of Injuries".

-After the fertilization of the Ovum by the sperm to Zygote "A cell with 46 Chromosomes", then the Zygote starts a rapid division to form blastocyst which is full of cells and these cells start to arrange into three Embryonic layers : 1-Endoderm. 2-Ectoderm. 3-Mesoderm. the epithelial tissue is derived from these 3 layers, whereas the Connective tissue is only derived from the Mesoderm.

## Slide (5):

### -Characteristics:

1.Cellularity: composed almost entirely of cells (with some extracellular matrix and sometimes other structures)

->Closely aggregated cells with very little intercellular substances.

2.Polarity: has specific top and bottom:

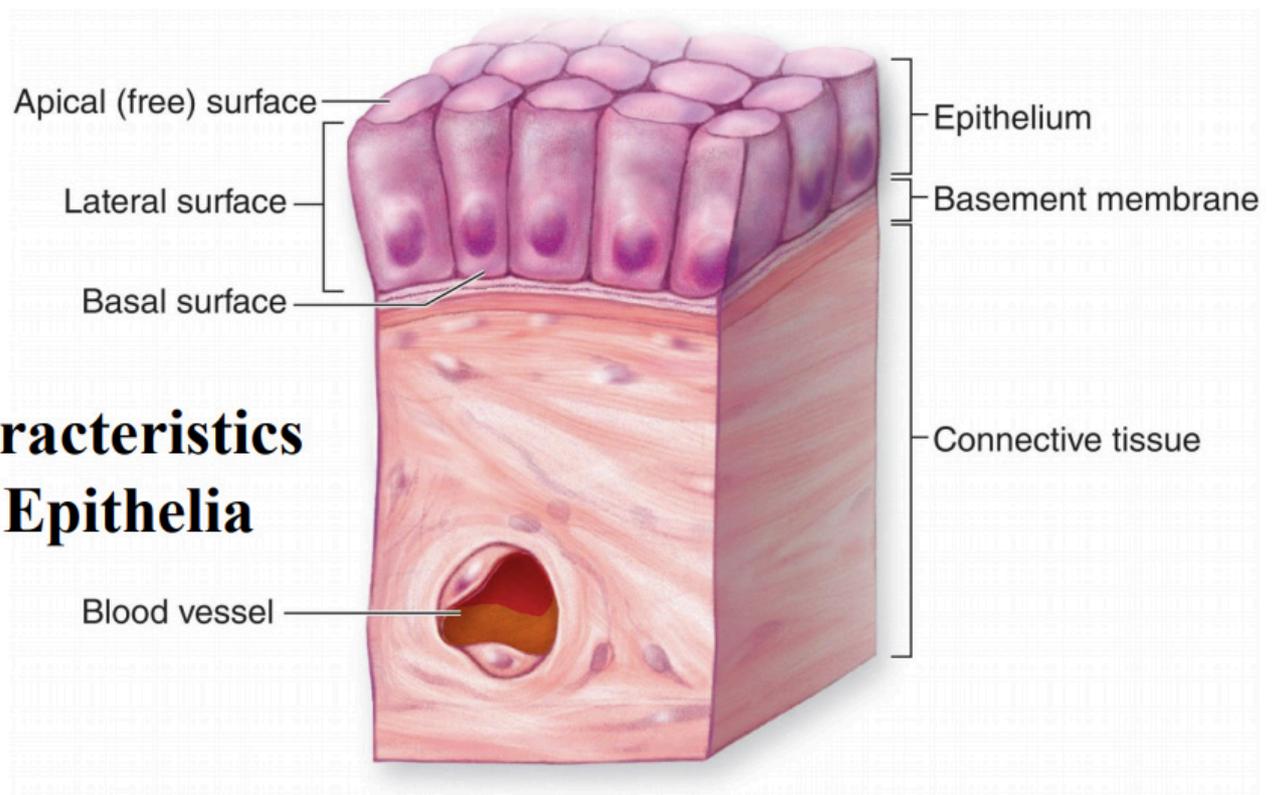
a.apical surface: exposed to external environment or internal body space.

b.basal surface attached to underlying connective tissue.

c.lateral surfaces connected by intercellular junctions

“Junction Complex”.

### Characteristics of Epithelia



3-Attachment: basal surface bound to basement membrane.

4-Avascularity: no blood vessels; receive nutrients across apical surface or by diffusion.

5-Innervation: lots of nerve endings.

6-High regeneration capacity: epithelial cells are frequently damaged or lost to abrasion, so they are replaced quickly.

## Slide (7):

### -Classification of Epithelium:

A-Covering and Lining Epithelium: When cells gather to cover.

B-Glandular (Secretory) Epithelium: Instead of making cover, the cells go inside the Connective Tissue and secrete substances.

C-Special Types: with special Functions.

### First things first, The Covering Epithelium:

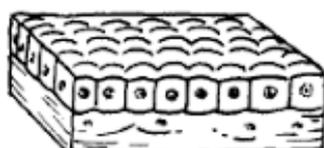
#### -Classification of the covering Epithelium:

1-Number of cells' layer:

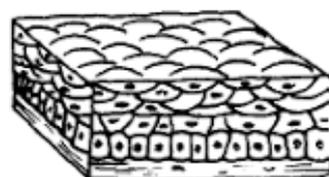
a-Simple: one cell layer and all the cells are attached directly to the Basement Membrane.

b-Stratified: more than 2 cells layer and only the first layer is directly attached to the Basement Membrane.

a. SIMPLE



b. STRATIFIED



-Cell Shape:

~Squamos-> flatened. ~Cuboidal->basicaly cube-shaped and roundish. ~Columnar: long and thin (like a cloumn).

~~~Pseudostratified: Looks like a statified but it's not, since it's composed of one layer of cells.

## 1-Simple Squamos Epithelium:

-Since the LM "Light Microscope" can't show the Cell Membrane, we will rely on the Nucleus shape to tell the type of the Epithelium, in the Simple Squamom the Nucleus shape is flat.

-Very thin and smooth.

-Found in the lung's alveolis, and it's function is ^Gas Exchange^ because it's very thing which facilitae this operation.

-Also found in Bowman's Capsule in the Kidney, and it's fuction is ^filtration of the blood^.

-Endothelium of the blood vessles. We use "Endothelium" instead of Simple Squamos Epithelium when we describe the inner cover of blood vessels and it's function is to provide smooth surface to prevent blood coagulation.

-Mesothelium in Pericardium, pleura and peritonieum. And it's function is to provide smooth surface because the heart, Lung, etc.. is in a continuous movement which can cause fricton in case of the absence of Mesothelium.

-Pericadriun-> Heart. Pleura->Lung. Peritonieum->Intestines.

## Slide (12):

### 2-Simple Cuboidal Epithelium:

- You can tell the Cuboidal by the rounded central Nucleus.
- Located in the Thyroid Gland -Found in the front of the neck- which contains Thyroid follicle, and the red substance is its secreted hormone.

In the Thyroid gland this tissue covers and secretes.

- Also found in the Kidney Tubules and its function is "Ion Exchange".

### 3-Simple Columnar Epithelium:

- Oval Nucleus

- Subdivided into two types:

A-Non-Ciliated. B-Ciliated.

- Ciliated does mean having Cilia, which is a moving organelle.

\* The cilium is an organelle found on eukaryotic cells in the shape of a slender protuberance that projects from the much larger cell body-Wikipedia\*

- The Ciliated are always found in the Respiratory System, why?

'cause the air we breathe is full of dust and Bacteria so the cilia is used to clean the tracts of this system.

### A-Simple Columnar "Non-Ciliated":

- Found in the Gastrointestinal tract to absorb the digested food.

- Also, found in the ducts of gland -Exocrine Glands- to secret.

## Slide (14):

### B-Simple Columnar "Ciliated":

- Found in the Bronchiole of the lung.
- Also, in the Uterus and Oviduct "Fallopian Tube" and this cilia moves the Ovum from the Ovary toward the Uterus.
- Movement of Luminal Contents.

### 4- Pseudostratified Columnar Epithelium:

- Due to the crowding in the room, the cells take this shape.
- Subdivided into:

#### A-Pseudostratified Columnar Epithelium "Non-Ciliated":

- Found in Male Genital and large ducts of glands.
- Male Genital is the pathway the sperm cross from the testis.
- In Male Genital this Epithelium function is to provide nutrients to the sperm.

#### B-Pseudostratified Columnar Epithelium "Ciliated":

- Found in Nose and Trachea "it's divided into 2 main Bronchi".
- Only found in the Respiratory system, hence they call it "Respiratory Epithelium".

## Slide (19):

### -Stratified Epithelium:

-Classification according to shape of most superficial layer.

1-Stratified squamous epithelium.

2-Stratified cuboidal epithelium.

3-Stratified columnar epithelium.

4-Transitional epithelium.

-Always for protection purposes because of its own thickness.

1-Stratified squamous epithelium:

-Subdivided into:

1-Non-Keratinized. 2-Keratinized.

-How to tell the difference between these two types?

If all the nucleus are present--> Non-Keratinized.

If some nucleus are absent and with a layer of fibers Congrats! that's--> Keratinized.

-Keratin provide toughness which contribute with the protection role they play, hence we found Keratinized in the skin and anything that opens toward the skin. For instance, Mouth Cavity and Anal Canal whereas the Oral Cavity from the inside is non-keratinized.

-Non-Keratinized is found in the Oesophagus, Cornea and Vagina.

-Physical Protection.

2&3 are very rare so don't pay attention.

#### 4-Transitional Epithelium:

- Only found in the Urinary Tract, hence it's called "Urothelium"
  - The Epithelium of the Urinary Bladder when it's empty can reach 10 layers and the spaces between them is abundant.
  - The superficial cells are rounded or dome-shaped, and have specialized membrane features enabling them to withstand the hypertonic effects of urine and protect underlying cells from this toxic solution-Junqueira's Basic Histology Text and Atlas\*
  - This dome-shaped cells may have more than one nucleus.
  - When the Urinary Bladder is full the layers become 3 or less.
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- Adaptation of Transitional epithelium to its function:
  - Thin corrugated basement membrane.
  - Abundant mucoid intercellular substance to allow gliding of cells on each other.
  - Cuticular border at the free surface "Provides Protection".