

# Epithelial Tissue

## Objectives:

By the end of this lecture, you should be able to:

- Describe general characteristics of epithelial tissue.
- Discuss microscopic structure and distribution of different types of epithelial membranes.
- Classify glandular epithelium according to different parameters.
- Enumerate the functions of epithelial tissue.
- Understand the following clinical applications:
  - Immotile cilia syndrome (Kartagener's syndrome).
  - Metaplasia.

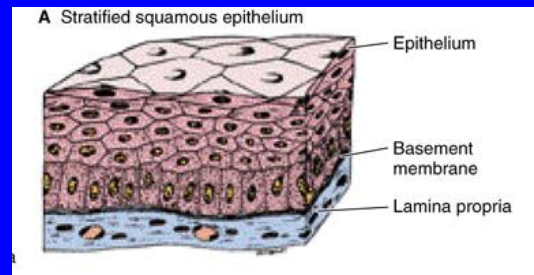
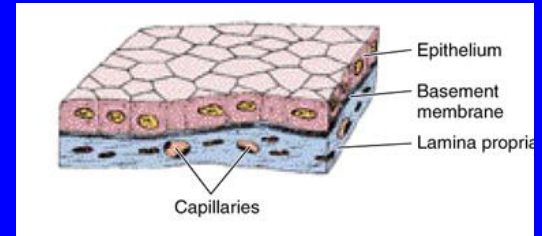
# EPITHELIAL TISSUE

## General characteristics:

- Cells are **tightly joined** with **little intercellular space**.
- Rest on a **basement membrane**.
- **Avascular**.
- High power of **regeneration**.

## Classification:

- **Epithelial membranes:**
  - Simple epithelium: one layer.
  - Stratified epithelium: more than one layer.
- **Glands (Glandular Epithelium).**



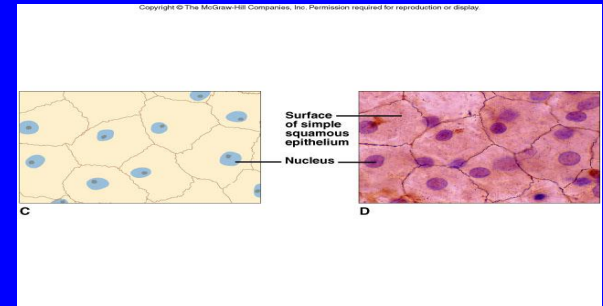
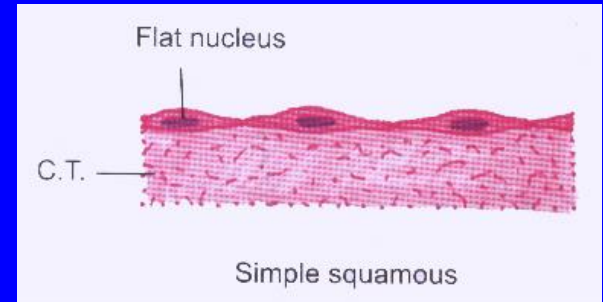
# I. Simple Epithelium

## 1- Simple Squamous Epithelium:

One layer of flat cells with flat nuclei. Provides smooth thin surface.

Examples of sites:

- Endothelium (lining the CVS).
- Alveoli of lung.



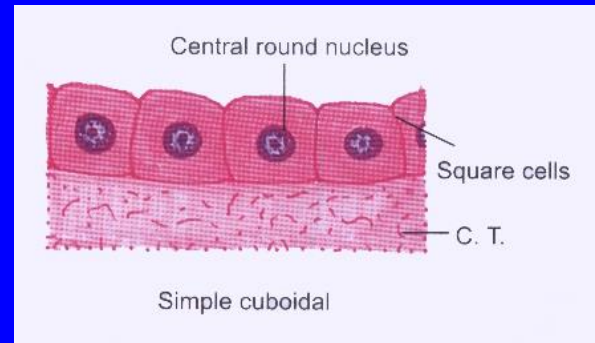
# I. Simple Epithelium

## 2- Simple Cuboidal Epithelium:

One layer of cuboidal cells with central rounded nuclei.

Example of sites:

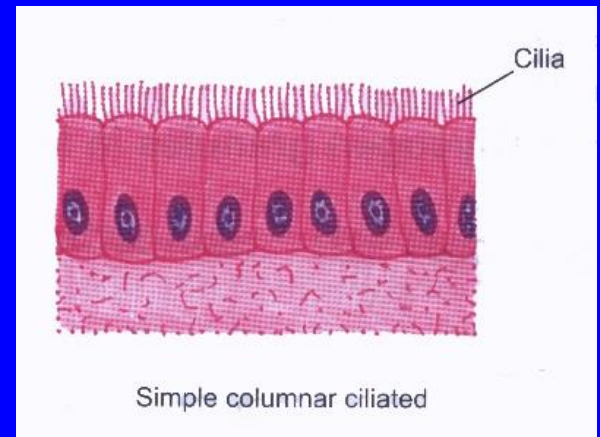
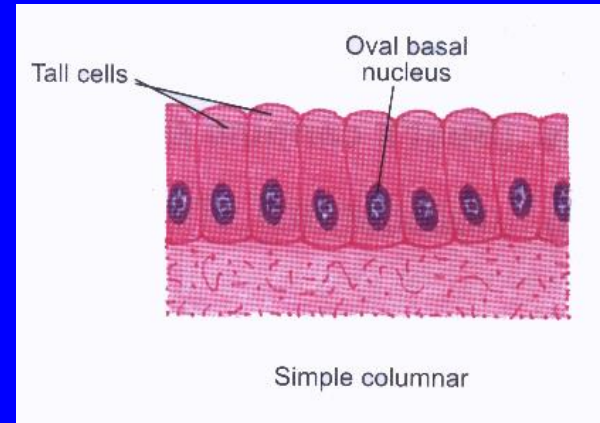
- Thyroid follicles.



# I. Simple Epithelium

## 3- Simple Columnar Epithelium:

- One layer of columnar cells with basal oval nuclei.
- Types:
  - » Non-ciliated:  
Example of sites: Lining of stomach, intestines (with goblet cells) & gall bladder.
  - » Ciliated: with cilia on free surface.  
Example of sites: Fallopian tubes.



# I. Simple Epithelium

## 4- Pseudo-Stratified Columnar:

- One layer of columnar cells.
- Some cells are tall.
- Others are short and don't reach the surface.
- All cells rest on the basement membrane.
- Nuclei appear at different levels.

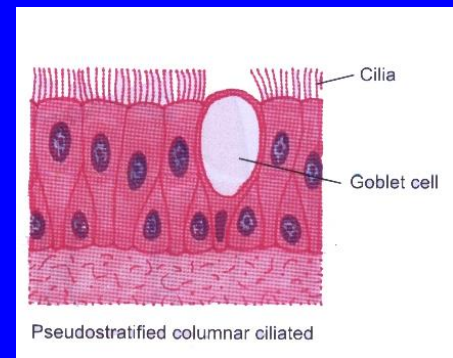
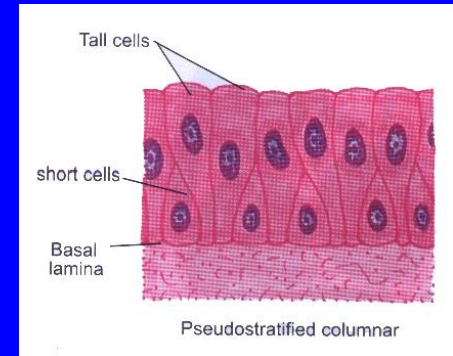
### ■ Types:

#### » Non-ciliated:

Example of sites: vas deferens.

#### » Ciliated with Goblet Cells:

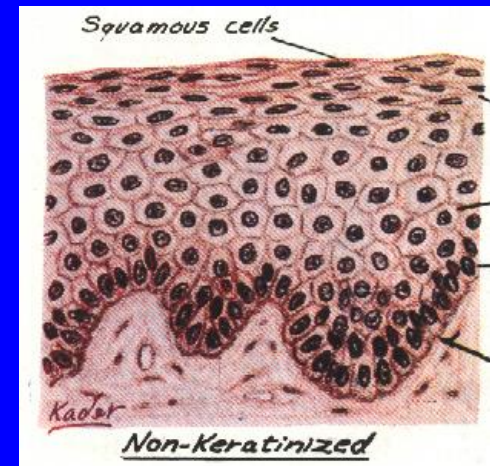
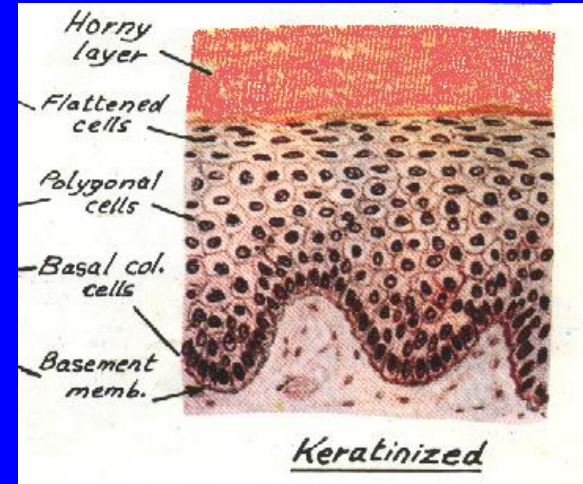
Example of sites: trachea & bronchi.



# II. Stratified Epithelium

## 1- Stratified Squamous Epithelium:

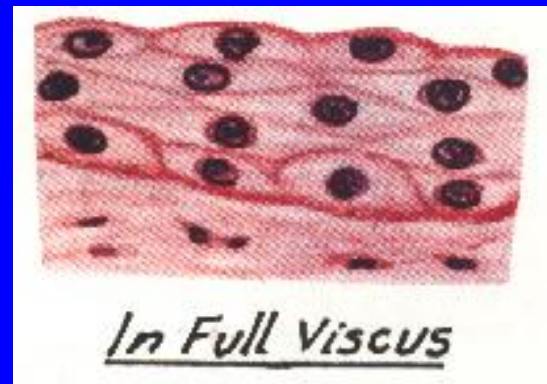
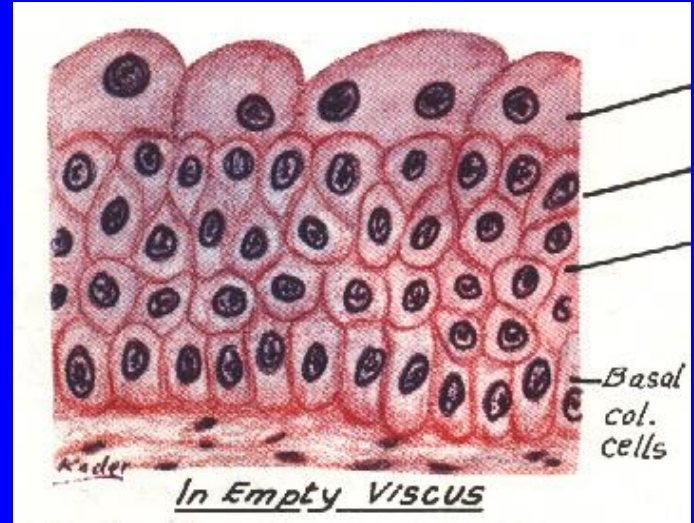
- Multiple layers of cells.
- Basal cells are columnar with basal oval nuclei.
- Intermediate cells are polygonal with central rounded nuclei.
- Surface cells are flat with flattened nuclei.
- Types:
  - » Keratinized: with a layer of keratin on the surface.  
Example of sites: epidermis of skin.
  - » Non-keratinized: without a layer of keratin on the surface.  
Example of sites: esophagus.



# II. Stratified Epithelium

## 2- Transitional Epithelium:

- Multiple layers of cells.
- Basal cells are columnar.
- Intermediate cells are polygonal.
- Surface cells large cuboidal with convex free surface and may be binucleated.
- Example of sites: Urinary bladder.

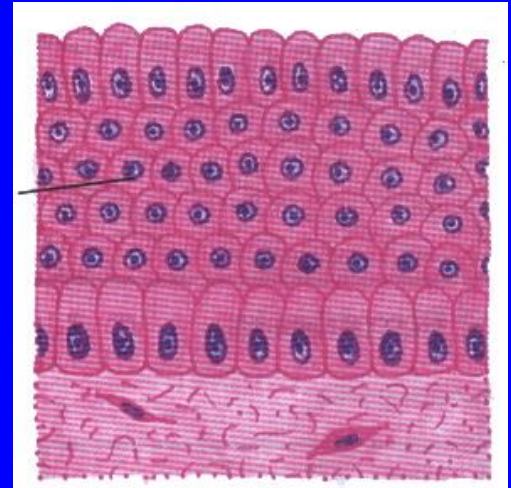




# II. Stratified Epithelium

## 3- Stratified Columnar Epithelium:

- Multiple layers of cells.
- Basal cells are columnar.
- Intermediate cells are polygonal.
- Surface cells are columnar.
- Example of sites: large ducts of glands.



# GLANDS (Glandular Epithelium)

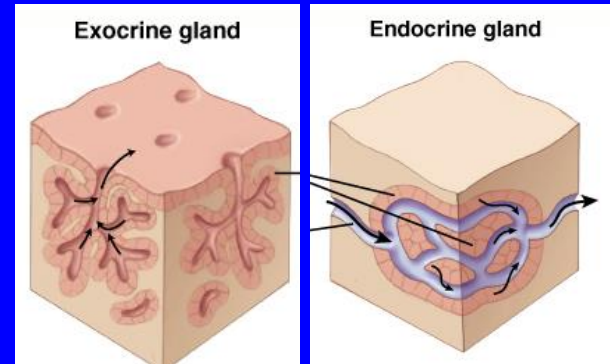
## Classification:

### 1- According to presence or absence of ducts:

- a. Exocrine: e.g. salivary glands.
- b. Endocrine: e.g. thyroid gland.
- c. Mixed: e.g. pancreas.

### 2- According to number of cells:

- a. Unicellular: e.g. goblet cells.
- b. Multicellular: e.g. salivary glands.

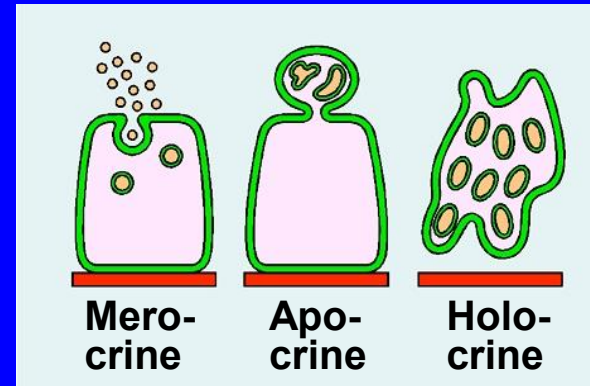


# GLANDS (Glandular Epithelium)

## Classification:

### 3- According to mode of secretion:

- a. **Merocrine**: No part of the cell is lost with the secretion, e.g. salivary glands.
- b. **Apocrine**: The top of the cell is lost with the secretion, e.g. mammary gland.
- c. **Holocrine**: The whole cell detaches with the secretion, e.g. sebaceous glands.

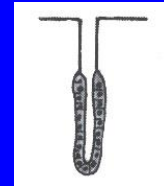


# GLANDS (Glandular Epithelium)

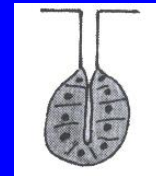
## Classification:

### 4- According to shape of secretory part:

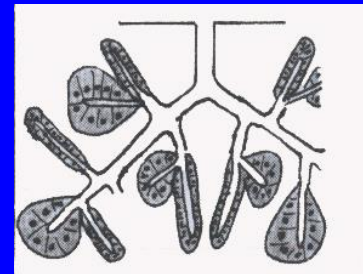
1. Tubular: e.g. intestinal gland.



2. Alveolar (acinar): e.g. mammary gland.



3. Tubulo-alveolar: e.g. pancreas.

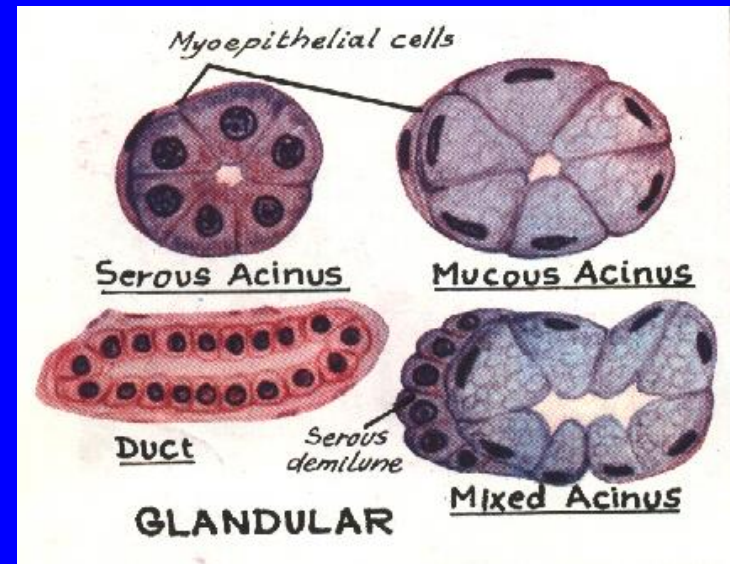


# GLANDS (Glandular Epithelium)

## Classification:

### 5- According to nature of secretion:

- a. Serous: e.g. parotid gland.
- b. Mucous: e.g. goblet cells.
- c. Muco-serous:  
e.g. sublingual gland.
- d. Watery: e.g. sweat gland.



# **FUNCTIONS OF EPITHELIUM**

- 1- **Protection** as in epidermis of skin.
- 2- **Secretion** as in glands.
- 3- **Absorption** as in small intestine.
- 4- **Excretion** as in kidney.
- 5- **Reproduction** as in gonads.
- 6- **Smooth lining** as in blood vessels.

# Clinical Applications

- **Immotile cilia syndrome (Kartegener's syndrome):**
  - Disorder that causes infertility in male and chronic respiratory tract infection in both sexes.
  - It is caused by immobility of cilia and flagella induced by deficiency of dynein.
  - Dynein protein is responsible for movements of cilia and flagella.

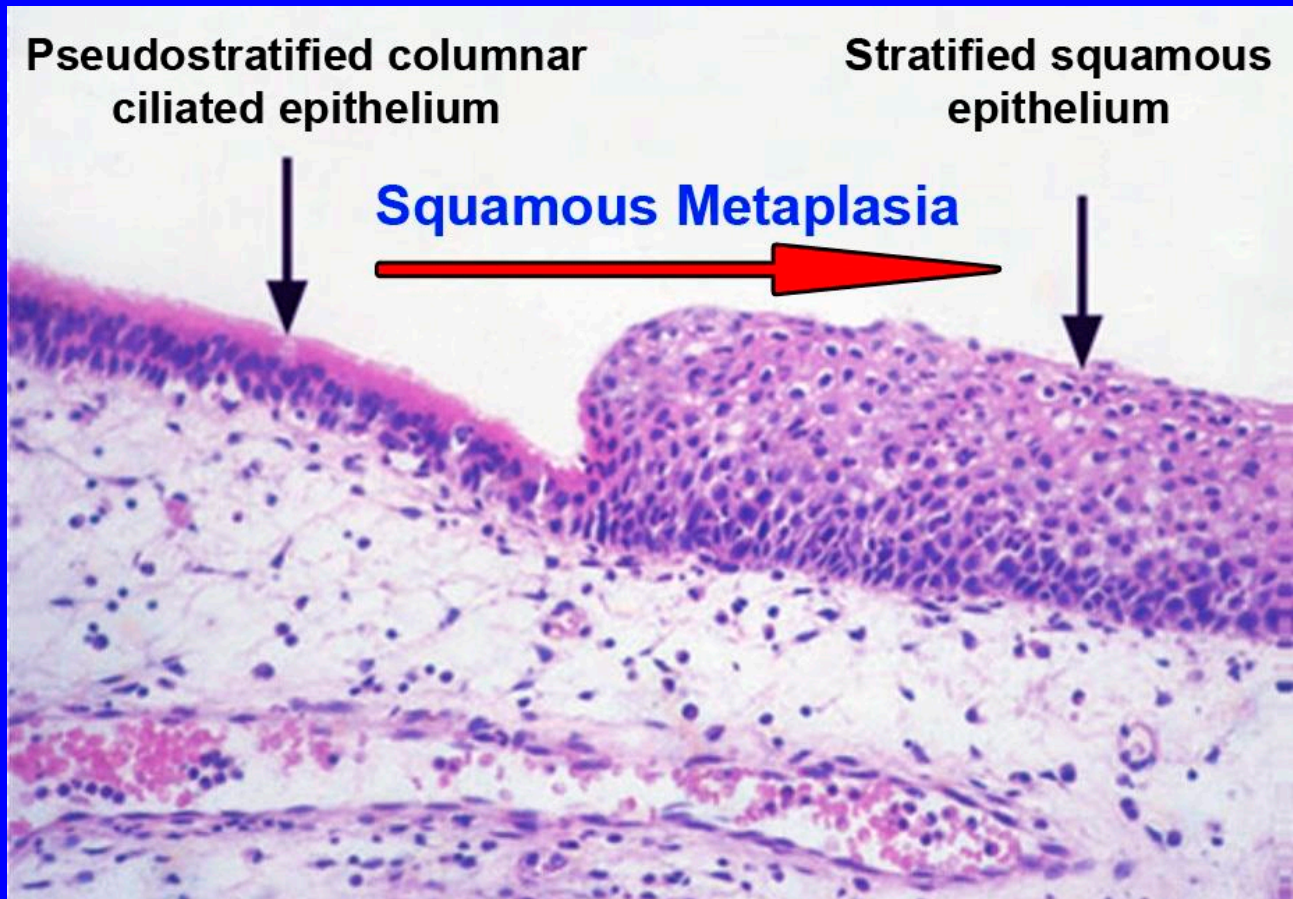
# Clinical Applications

## ■ Metaplasia:

- It is the transformation of one type of tissue to another in response to injury. This condition is usually reversible if the injury is removed.
- Example: pseudostratified ciliated columnar epithelium of the respiratory passages, e.g. trachea, of heavy smokers may undergo squamous metaplasia, transforming into stratified squamous epithelium.



# Squamous Metaplasia



**Thank You**