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.

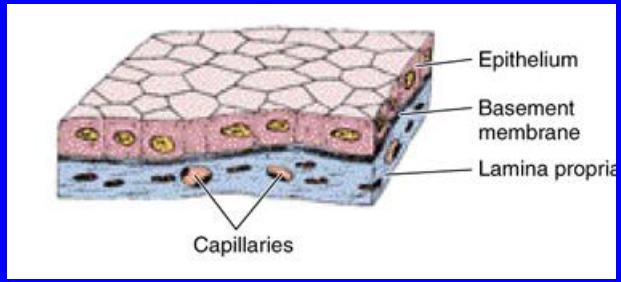
EPITHELIAL TISSUE

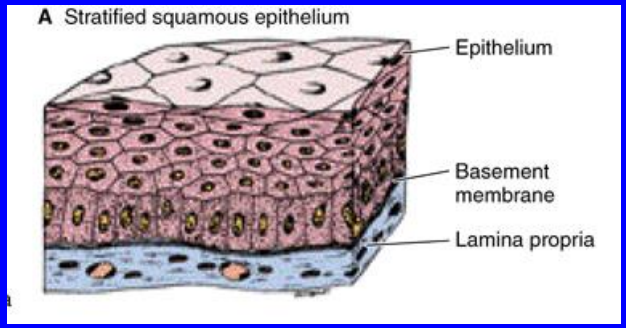
General characteristics:

- 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).**

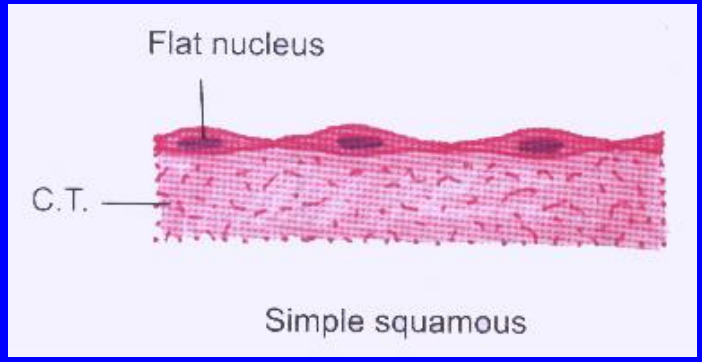




I. Simple Epithelium

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.

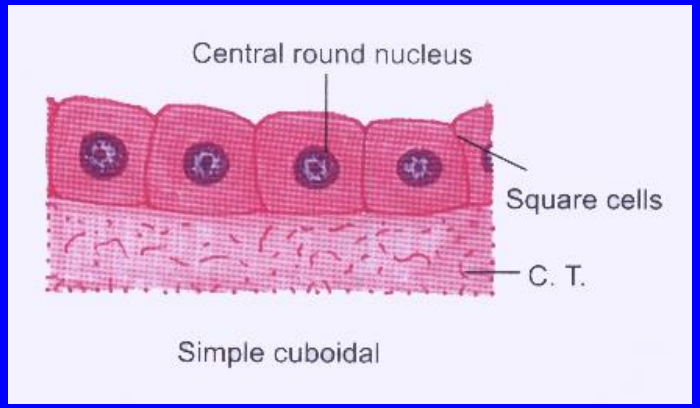
I. Simple Epithelium

2- Simple Cuboidal Epithelium:

One layer of cuboidal cells with central rounded nuclei.

Example of sites:

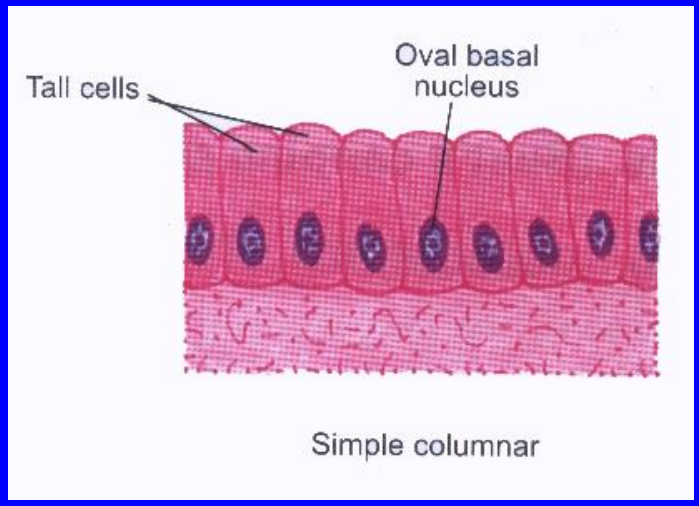
– Thyroid follicles.

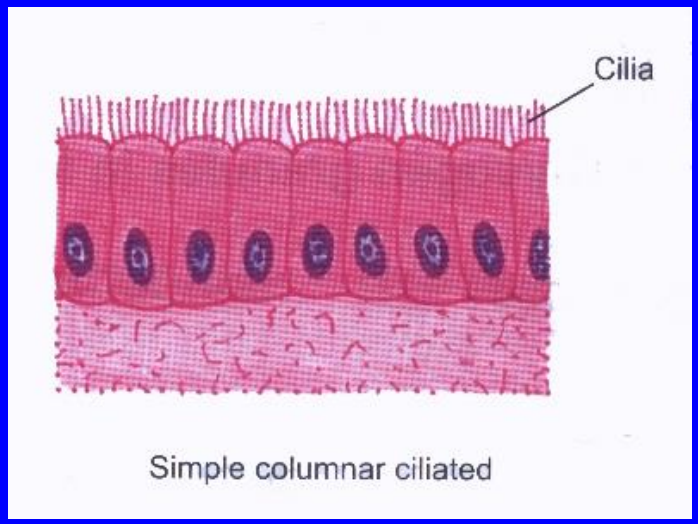


I. Simple Epithelium

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.

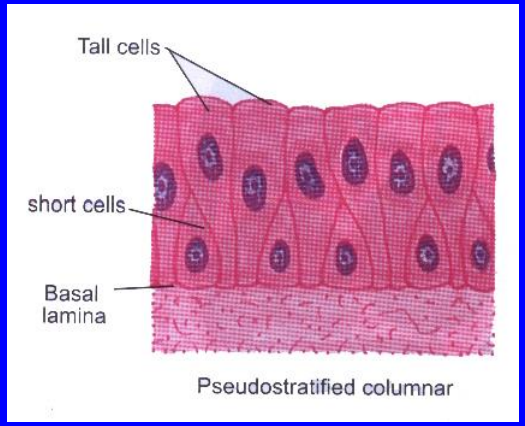


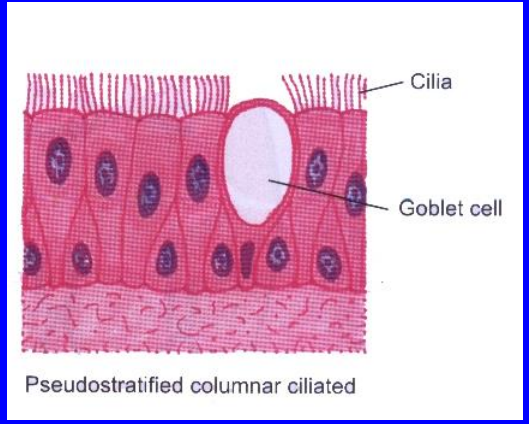


I. Simple Epithelium

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.

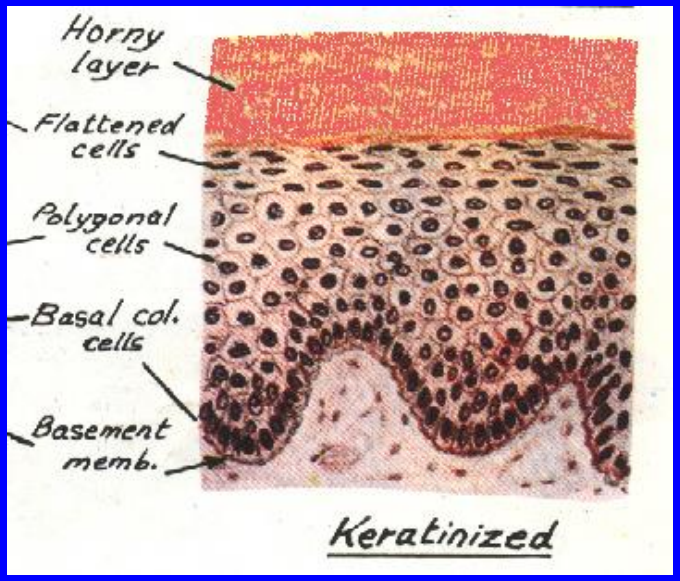


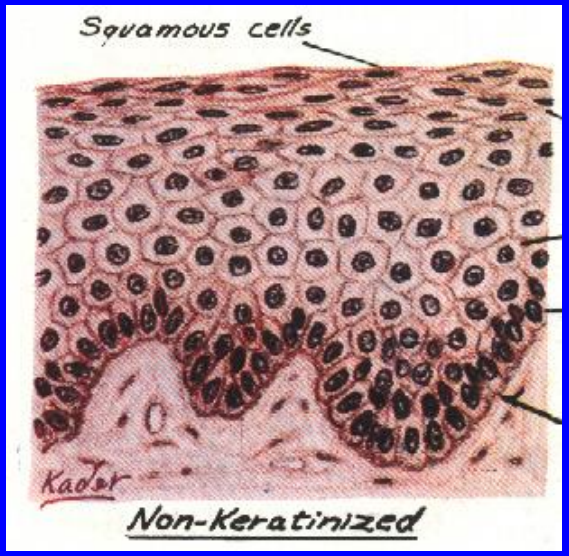


II. Stratified Epithelium

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.

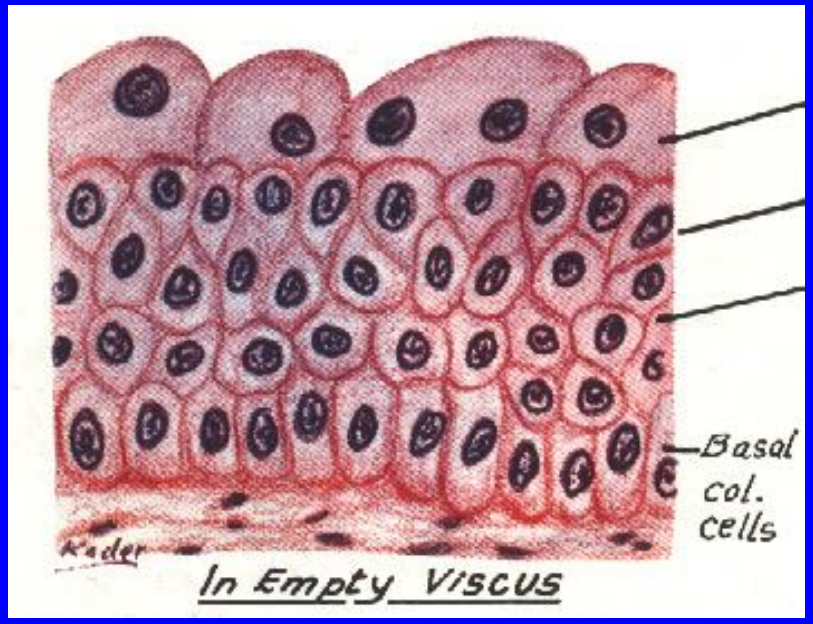


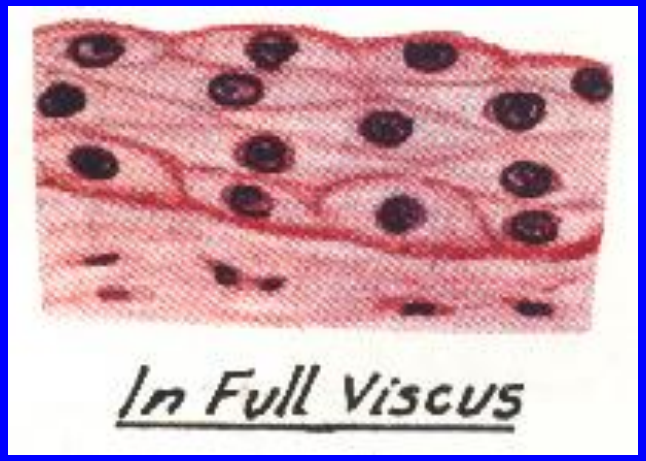


II. Stratified Epithelium

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.

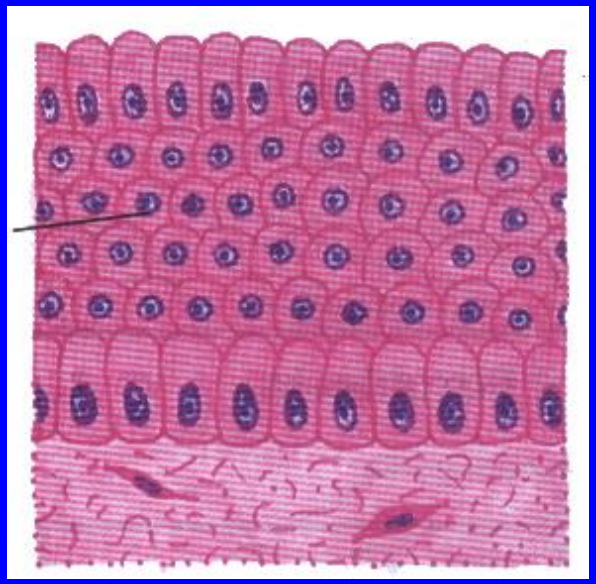




II. Stratified Epithelium

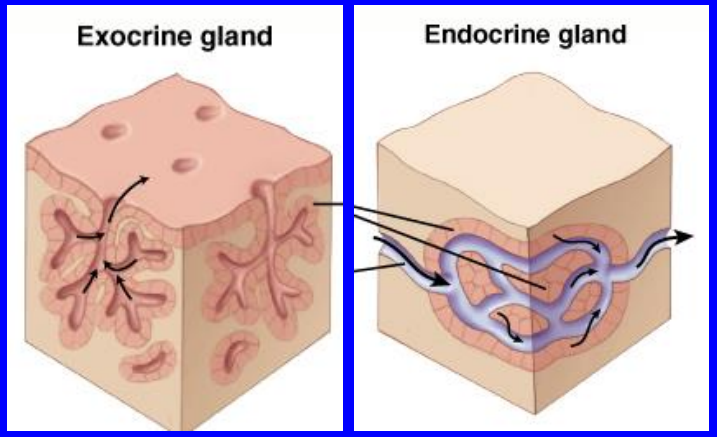
3- Stratified Columnar Epithelium:

- 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)

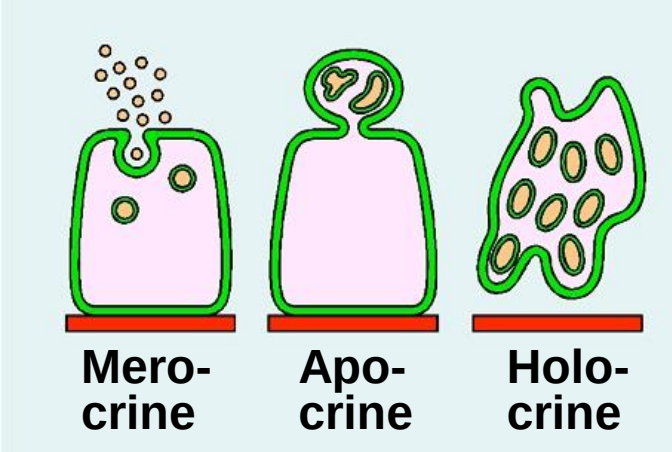
Classification:

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.



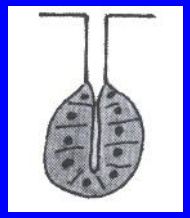
GLANDS (Glandular Epithelium)

Classification:

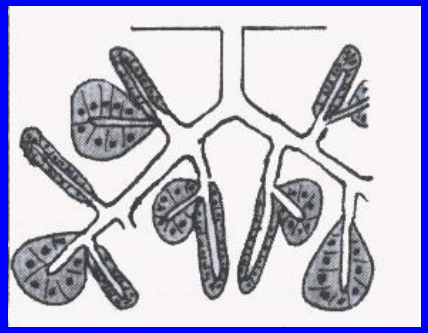
4- **According to shape of secretory part:**

1. **Tubular:** e.g. intestinal gland.

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



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



GLANDS (Glandular Epithelium)

Classification:

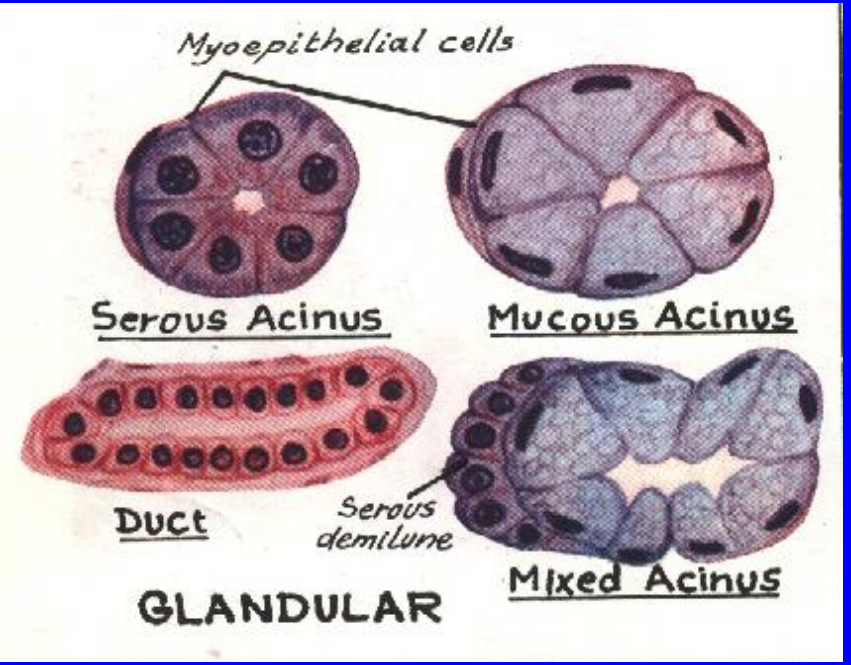
5- **According to nature of secretion:**

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.

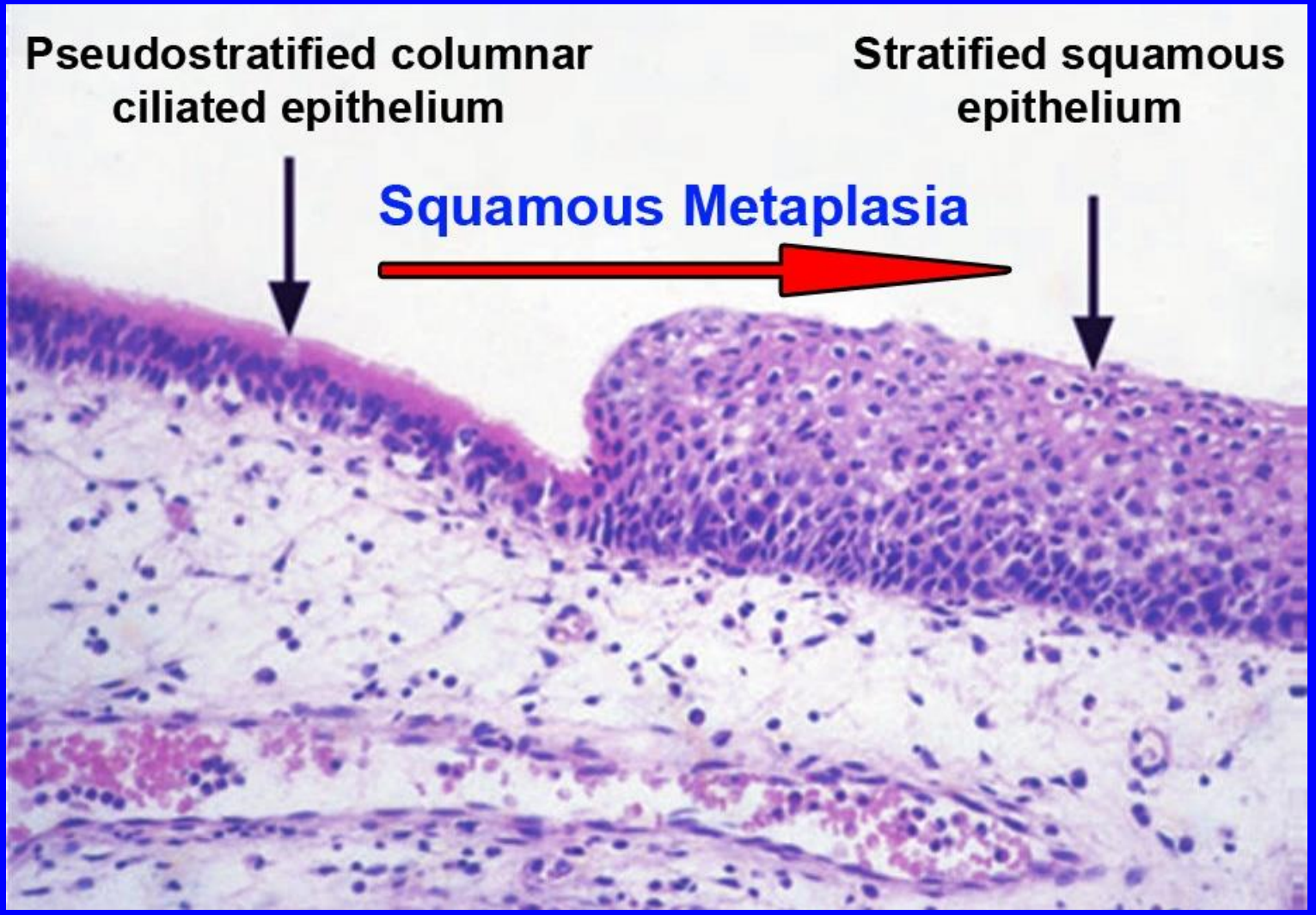
Clinical Applications

- **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



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