

# ***BODY TISSUES***

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# Tissues

Cells work together in functionally related groups called tissues

- Embryonic CT
- Adult CT

# Embryonic Tissue

3 major germ layers that form the embryonic disc (source of stem cells) –

## Endoderm

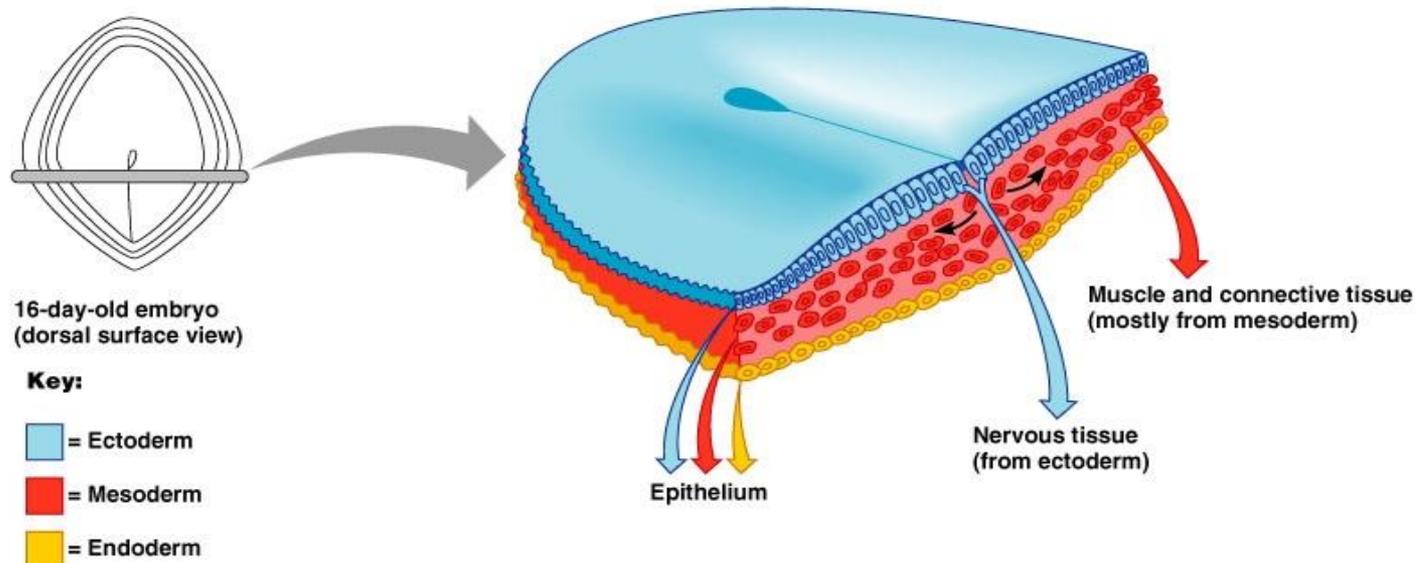
- Inner layer
- Forms lining of digestive tract and derivatives –

## Mesoderm

- Middle layer
- Forms tissues as such muscle, bone, blood vessels

## Ectoderm

- Outer layer
- Forms skin and neuroectoderm



# CLASSIFICATION OF TISSUES

Based on structure of cells, composition of matrix and cell functions.

Types of tissues:

1. Epithelial – lining and covering
2. Connective – support
3. Muscle – movement
4. Nervous – control

Epithelium

# Epithelial Tissue

**Definition:** “Closely packed cells with very little or no intercellular material lying on a basement membrane, covering internal and external surfaces of the body and most organs.”

# Characteristics of epithelia

- Cellularity - Consists almost entirely of cells
- Covers body surfaces, lines hollow organs, and forms glands – Outside surface of the body – Lining of digestive, respiratory and urogenital systems

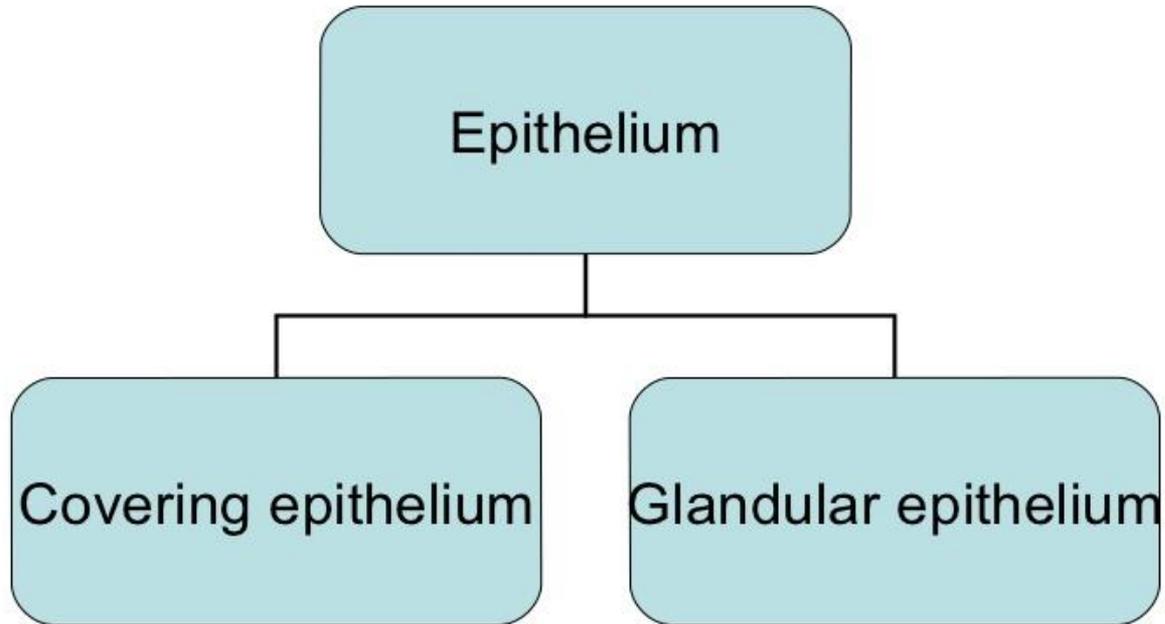
## Heart and blood vessels

- Linings of many body cavities
- Polarity - Has apical, basal, and lateral surfaces
- Rests on a basement membrane
- Specialized cell contacts bind adjacent cells together
- Avascular - no blood vessels
- Regenerative -Replaces lost cells by cell division

# Functions of Epithelia

- Protecting underlying structures; e.g., epithelium lining the mouth
- Acting as barriers; e.g., skin
- Permitting the passage of substances; e.g., cells lining air sacs in lungs and nephrons in kidney
- Secreting substances; e.g., pancreatic cells
- Absorbing substances; e.g., lining of stomach and small intestine

## Classification:



Terms that help us understand what kinds of tissues we are identifying:

### Terms referring to the layers

- *Simple* = one layer
- *Stratified* = more than one layer
- *Pseudostratified* = false layered (appears to be more than one layer, but only one); *ciliated* = with cilia

### Terms referring to the cell shapes

- *Squamous* = flat
- *Cuboidal* = cube
- *Columnar* = rectangular (column)
- *Transitional* = ability to change shape

# Basal Feature: The Basal Lamina

- Non-cellular supporting sheet between the epithelium and the connective tissue deep to it
- Consists of proteins secreted by the epithelial cells

## Functions:

- Acts as a selective filter, determining which molecules from capillaries enter the epithelium
- Acts as scaffolding along which regenerating epithelial cells can migrate
- Basal lamina and reticular layers of the underlying connective tissue deep to it form the basement membrane

## Classification of Epithelium

- **Number of layers of cells**

**Simple**- one layer of cells. Each extends from basement membrane to the free surface –

**Stratified**- more than one layer.

**Pseudo-stratified**- tissue appears to be stratified, but all cells contact basement membrane so it is in fact simple

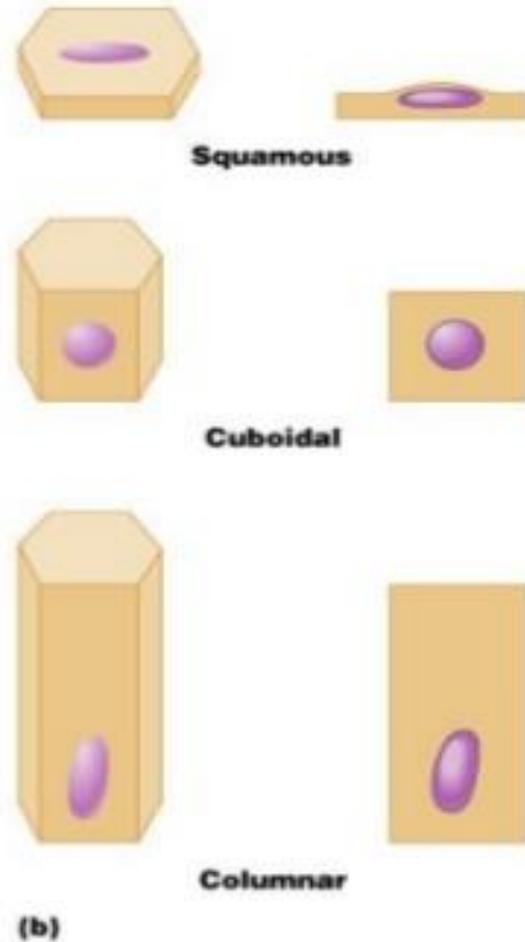
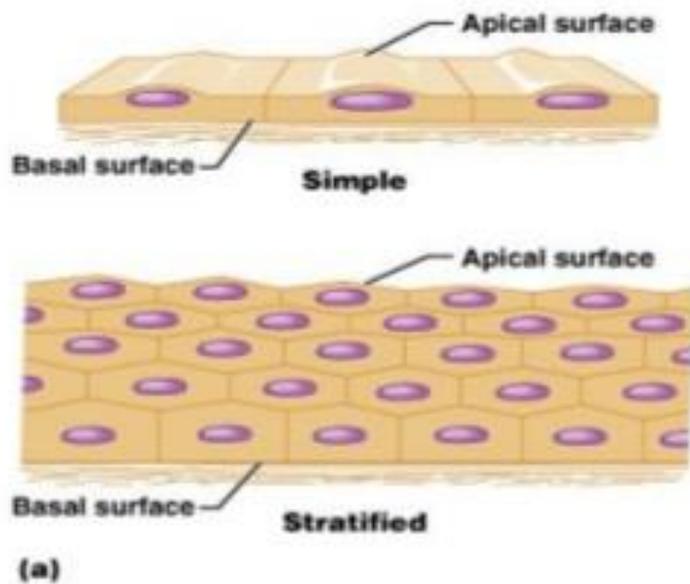
- **Shape of cells**

- **Squamous**- flat, scale-like

- **Cuboidal**- about equal in height and width

- **Columnar**- taller than wide

# Classifications of Epithelia

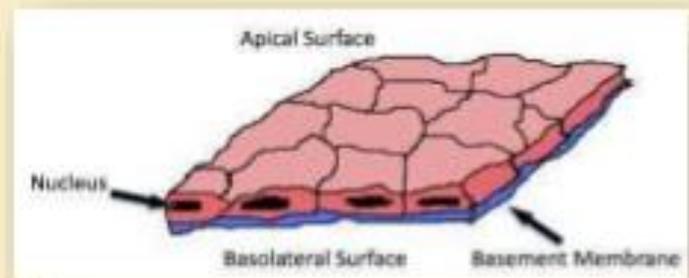


# Squamous Epithelium

- ▶ *It consists of a single thin layer of flattened cells with irregular boundaries.*
- ▶ *This epithelium occurs in the walls of blood vessels, air sacs of the lungs, lymph vessels, wall of Bowman's capsule, loops of Henle of the nephrons of Kidneys, coelomic cavities.*

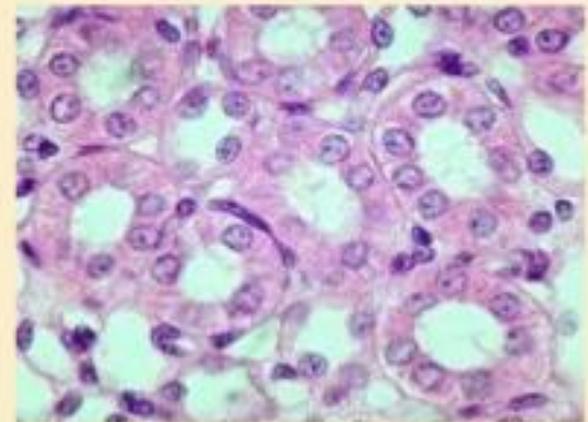
- ▶ *Functions:*

- ❖ *Exchange of gases.*
- ❖ *Filtration in Bowman's Capsule.*
- ❖ *Exchange of materials in blood capillaries and tissue fluid*



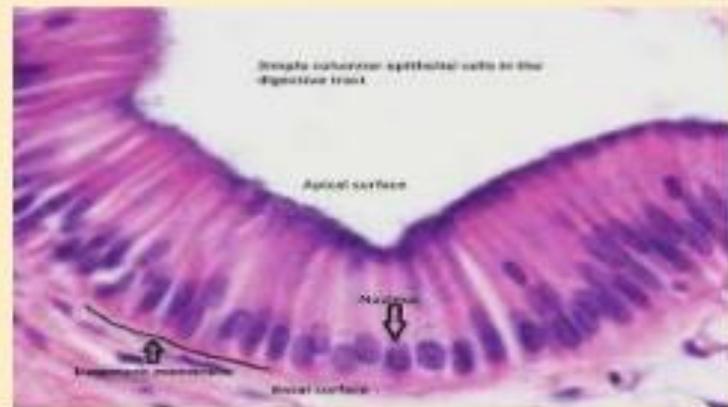
# Cuboidal Epithelium

- ▶ *It consists of a single layer of cube-like (cubical) cells lying on a basement membrane. Nuclei are rounded and lie in the centre of the cells. Free surfaces of the cells may be smooth or bear minute finger-like projections known as microvilli.*
- ▶ *It is generally found in the tubular parts of nephrons in kidneys, ducts of glands thyroid follicles, ovaries and testes.*
- ▶ *Function:*
  - ❖ *Reabsorption of useful substances.*
  - ❖ *Secretion and excretion by glands.*



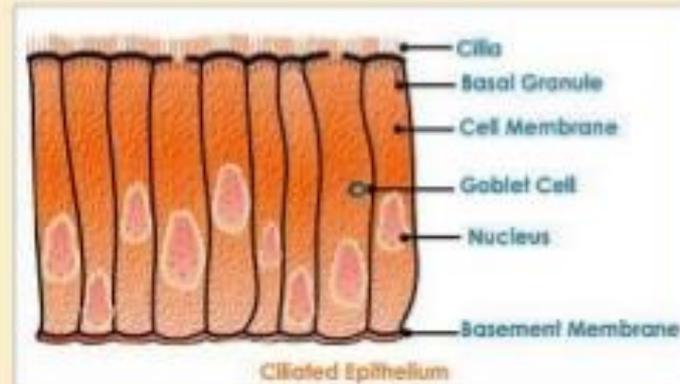
# Columnar Epithelium

- ▶ *It consists of a single layer of tall and slender cells, lying on a basement membrane.*
- ▶ *The intestinal mucosa bearing microvilli is called brush-bordered columnar epithelium.*
- ▶ *It is found in the lining of the stomach and intestine.*
- ▶ *Function:*
  - ❖ *Absorption*
  - ❖ *Secretion*



# Ciliated Epithelium

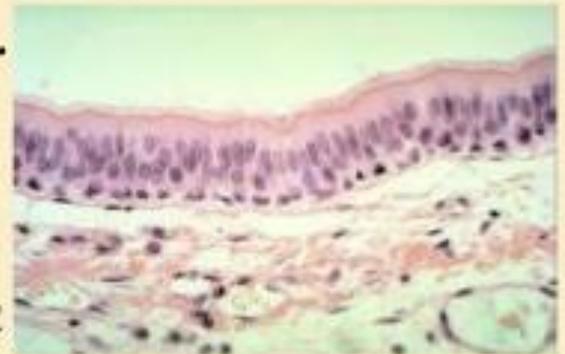
- ▶ *If the columnar or cuboidal cells bear cilia on their free surface, they are called ciliated epithelium.*
- ▶ *It is of two types: i) Ciliated cuboidal epithelium and ii) Ciliated columnar epithelium*



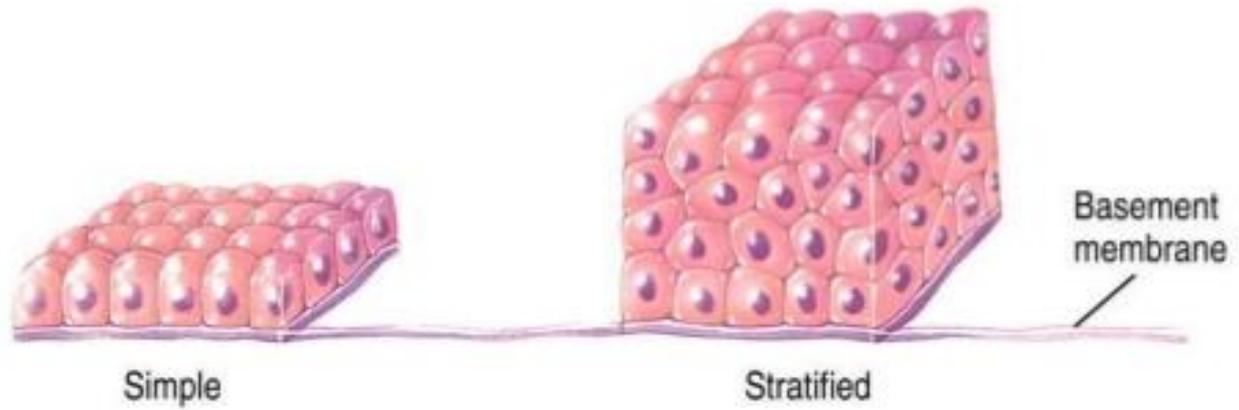
- ▶ *Function:*
  - ❖ *It is responsible for passing of ovum through fallopian tube.*
  - ❖ *In respiratory tract, it helps in expelling the mucus and particles trapped in it, towards the pharynx.*

# Pseudostratified Epithelium

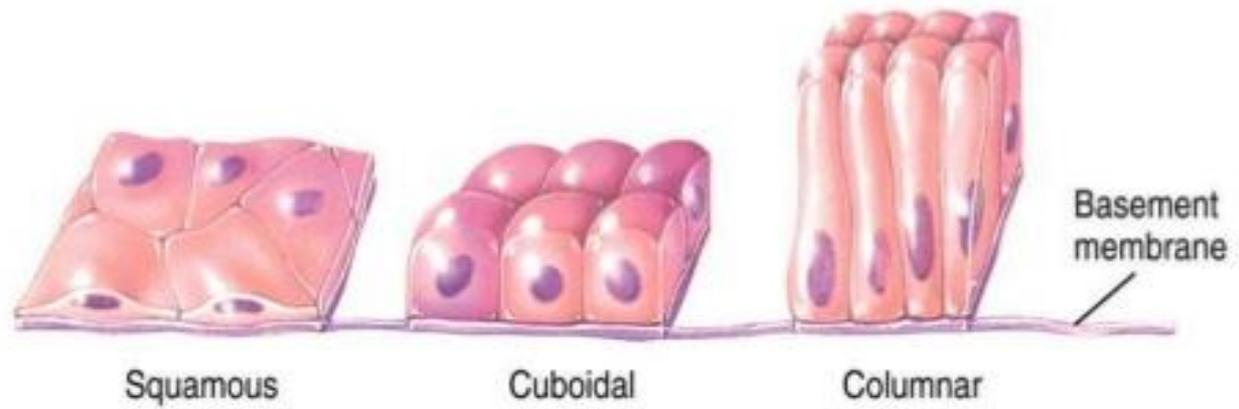
- ▶ *A pseudostratified epithelium is a type of epithelium that, though comprising only a single layer of cells, has its cell nuclei positioned in a manner suggestive of stratified epithelia.*
- ▶ *Its cells are columnar but unequal in size.*
- ▶ *Pseudostratified non-ciliated columnar epithelium tissue is found in urethra of human male and in large ducts of certain glands such as parotid gland.*
- ▶ *Pseudostratified ciliated columnar epithelium is found in trachea and large bronchi.*



Arrangement of layers



Cell shape



## Stratified Epithelia

- Contain two or more layers of cells
- Regenerate from below
- Major role is protection
- Are named according to the shape of cells at apical layer

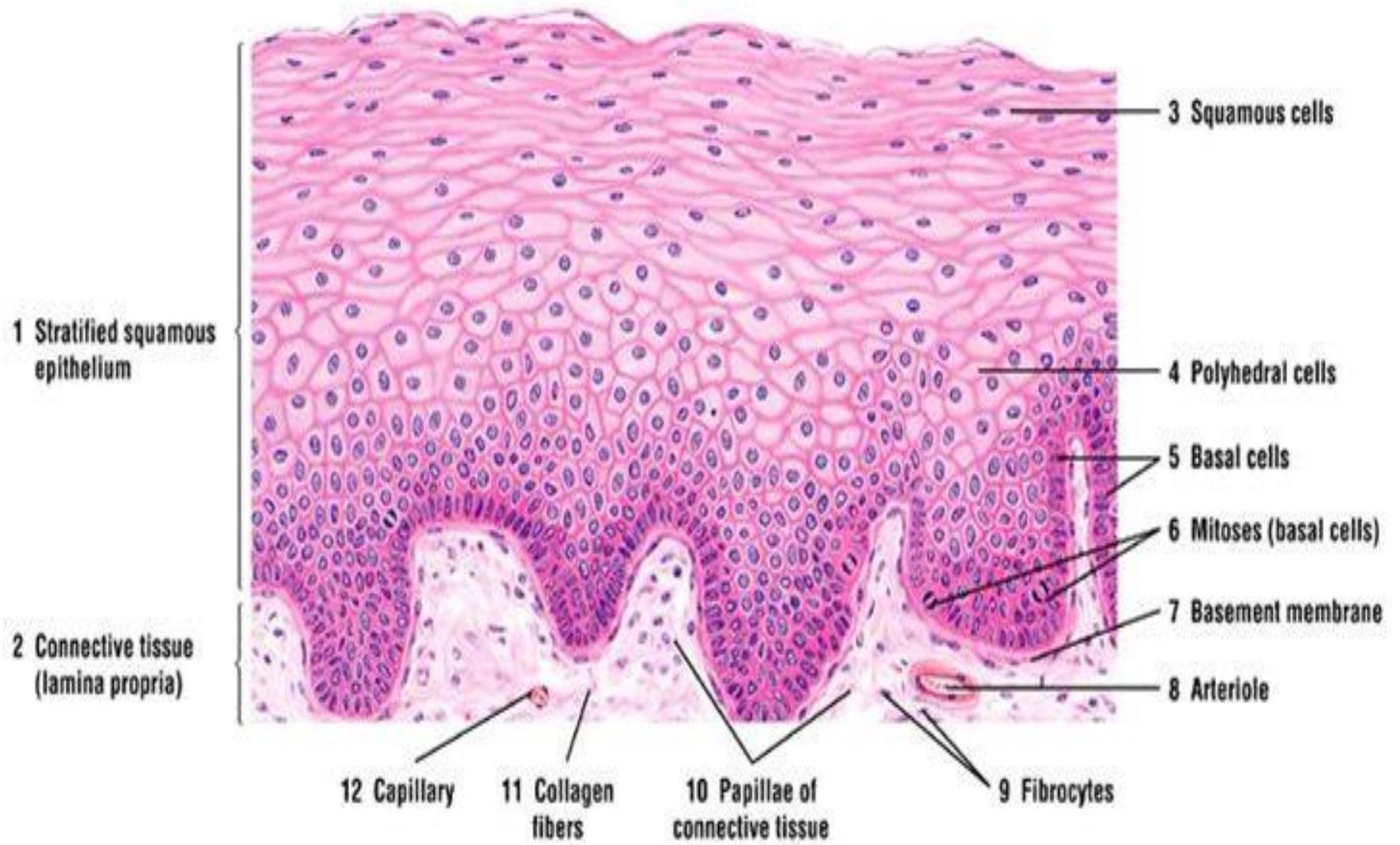
## Stratified Squamous Epithelium

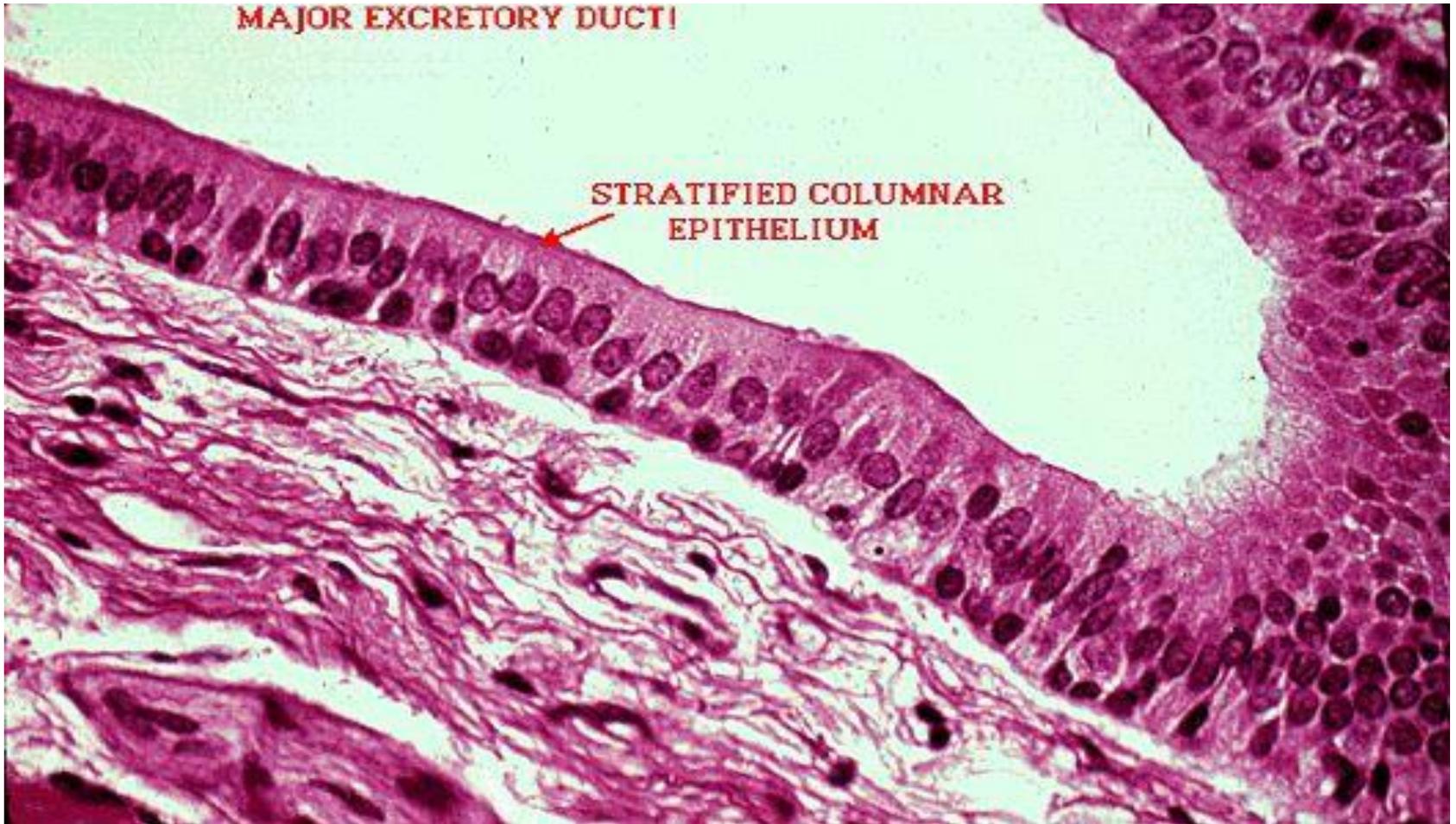
Description – Many layers of cells

- – squamous in shape
- – Deeper layers of cells appear Cuboidal or columnar
- – Thickest epithelial tissue
- – adapted for protection .

Specific types

- – Keratinized – contain the protective protein keratin .
- Surface cells are dead and full of keratin.
- – Non-keratinized – forms moist lining of body openings.
  
- Function – Protects underlying tissues in areas subject to abrasion.
- Location – Keratinized – forms epidermis.
- – Non-keratinized – forms lining of esophagus, mouth, and vagina .

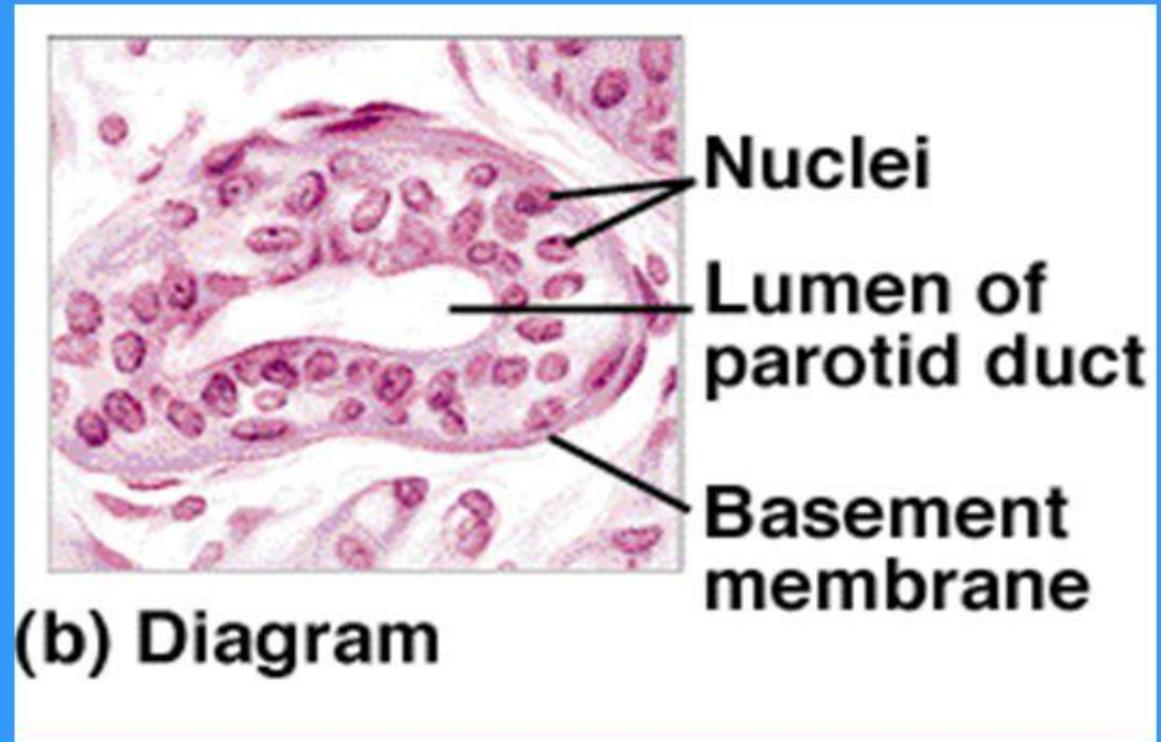




Examples: Ducts of glands, pharynx and male urethra

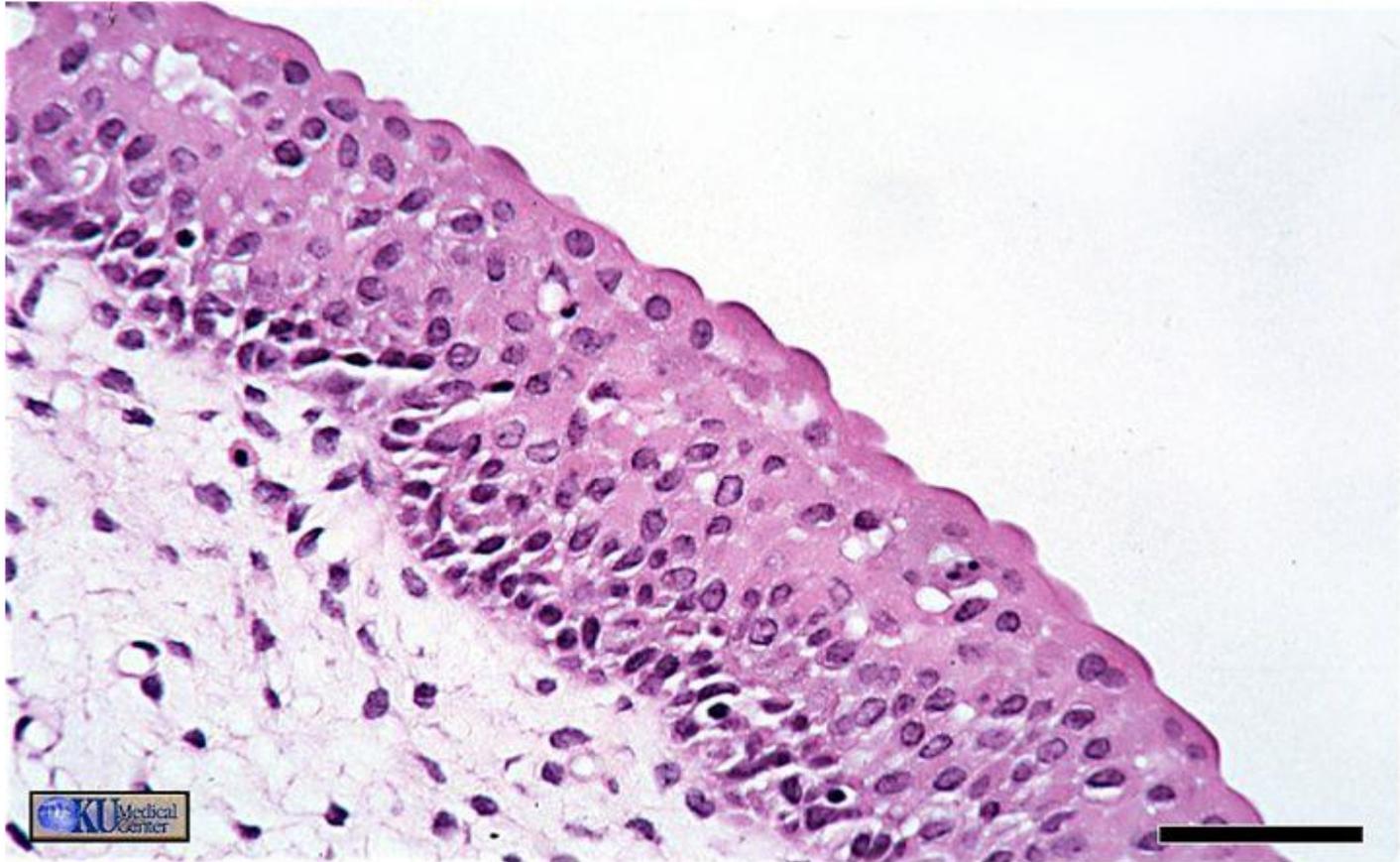
# Stratified Epithelium: Stratified Cuboidal Epithelium

- Stratified cuboidal forming a salivary duct



Examples: Ducts of salivary glands, mammary gland

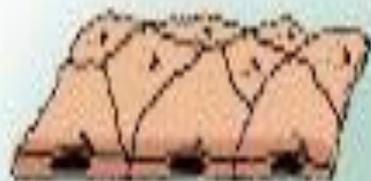
# Transitional Epithelium



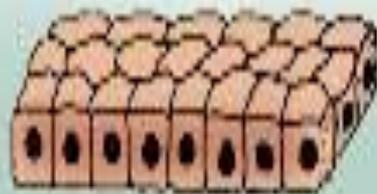
## Urinary Bladder

The expandable stratified epithelium of the bladder is referred to as transitional epithelium. Note that its surface cells are large rather than flattened as in stratified squamous epithelium.

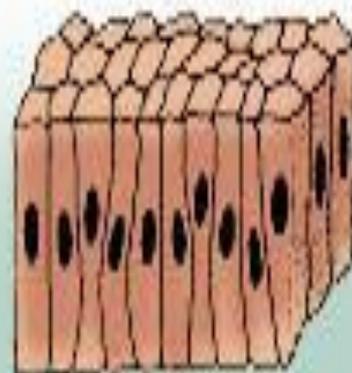
# Types of Epithelium



Simple squamous

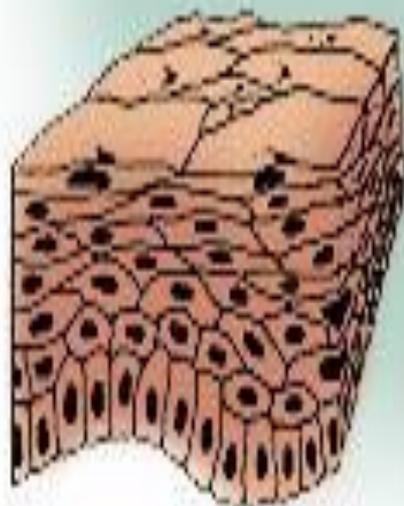


Simple cuboidal

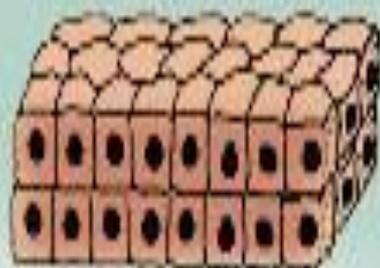


Simple columnar

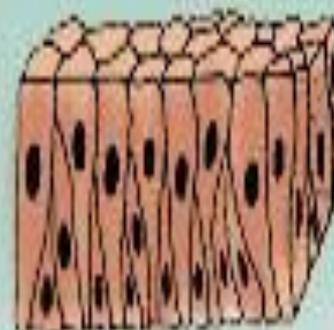
Transitional



Stratified squamous



Stratified cuboidal



Pseudostratified columnar

