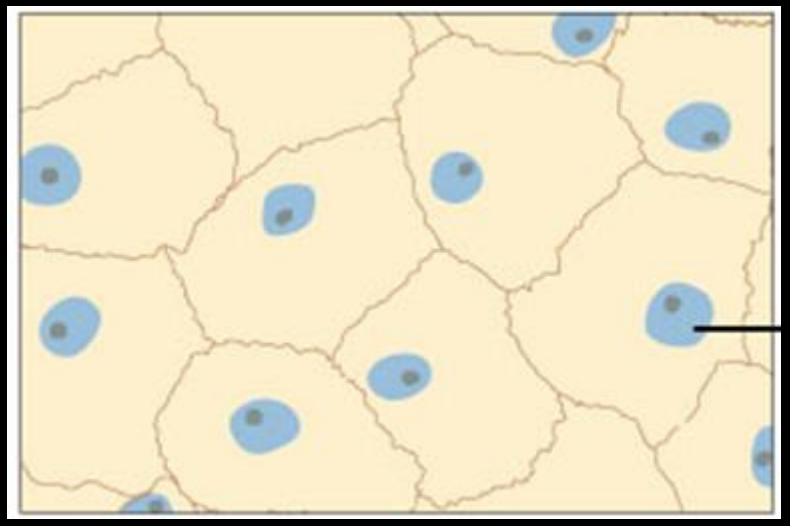
Epithelial Tissue

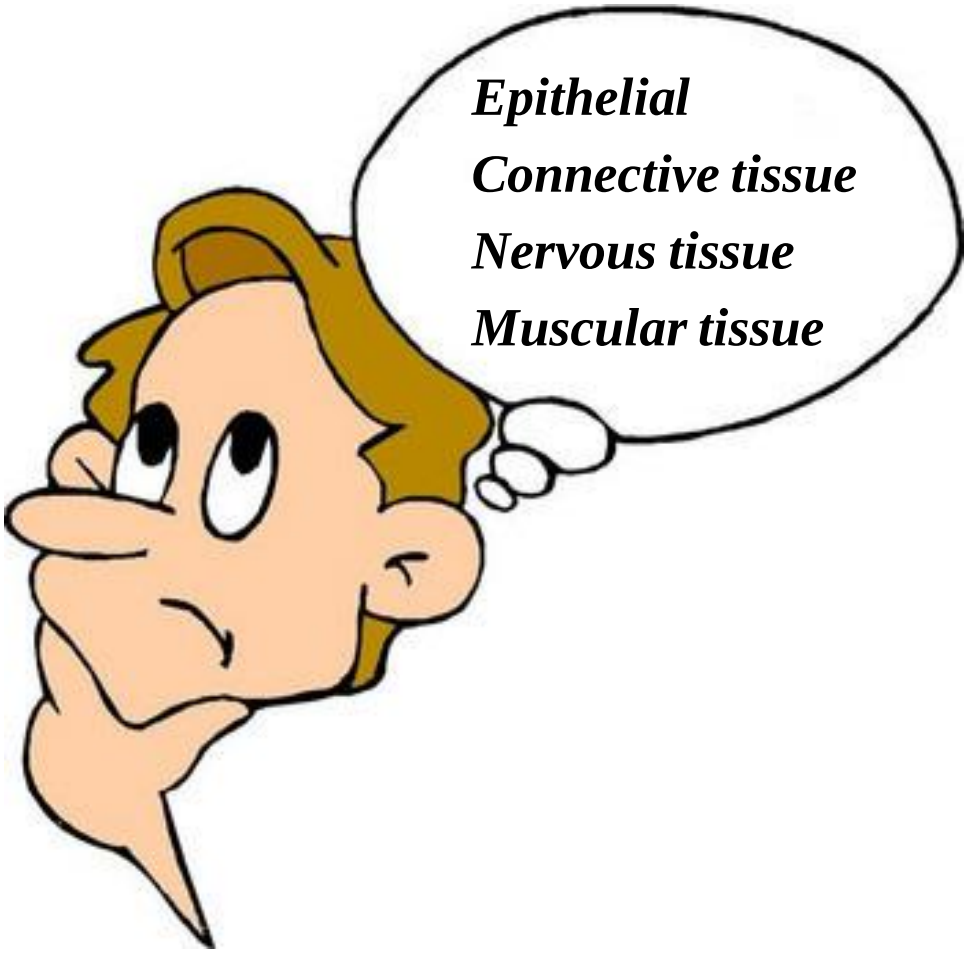


Objectives

- Define the term epithelium.
- State the general functions of the epithelial tissue.
- Classify epithelial tissue.
- State the location of each type of epithelial tissue.
- State the specific function of each type of epithelial tissue.
- Explain the terms endothelium and mesothelium.

Tissue

Tissue


Epithelial
Connective tissue
Nervous tissue
Muscular tissue

Tissue

- Collections of specialized cells and cell products that perform a specific function.

Epithelial Tissue

- Covers exposed surfaces, lines passageways & body cavities, and forms glands.

Epithelial Tissue – Embryology

- All 3 germ layers
  - ectoderm - epidermis
  - endoderm - lining of the gastrointestinal tract
  - mesoderm - inner linings of body cavities

(Pericardial, pleural, peritoneal)

⇩

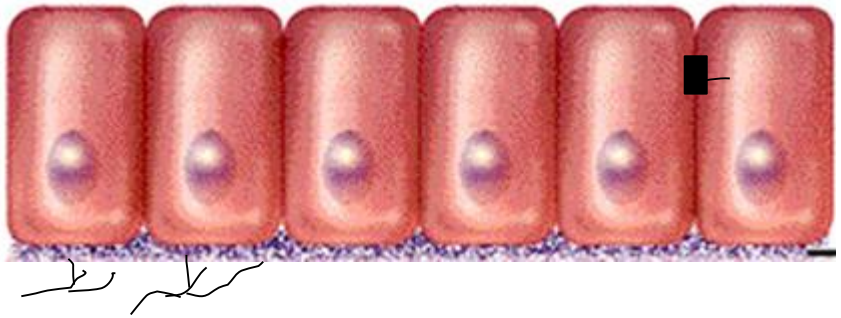
Mesothelium

- lining of blood vessels ⇨ ***Endothelium***

Epithelial Tissue

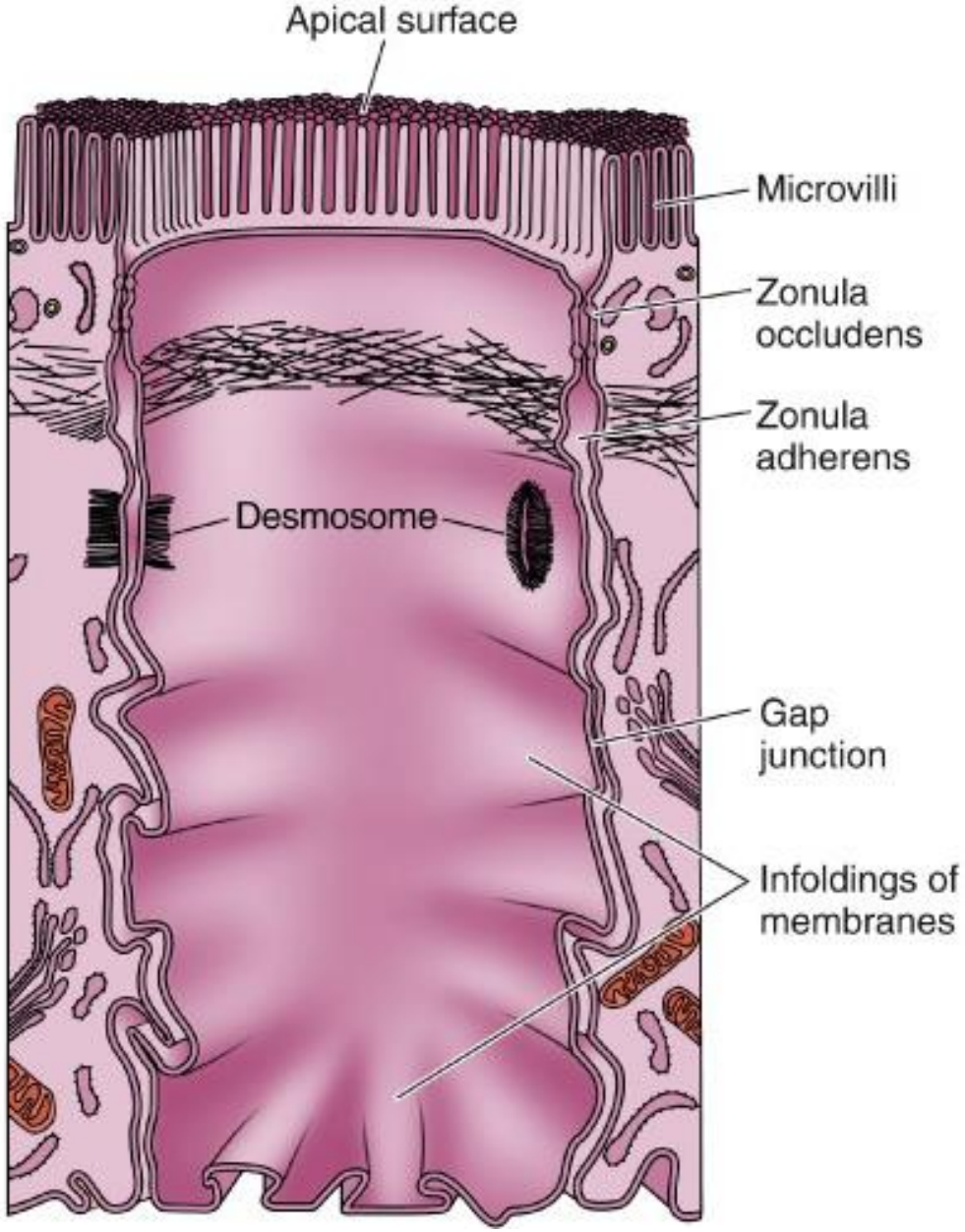
- **2 main groups**
  - ***Covering and lining membranes***
  - ***Glands (derived from epithelial membranes)***

Common features of Epithelia

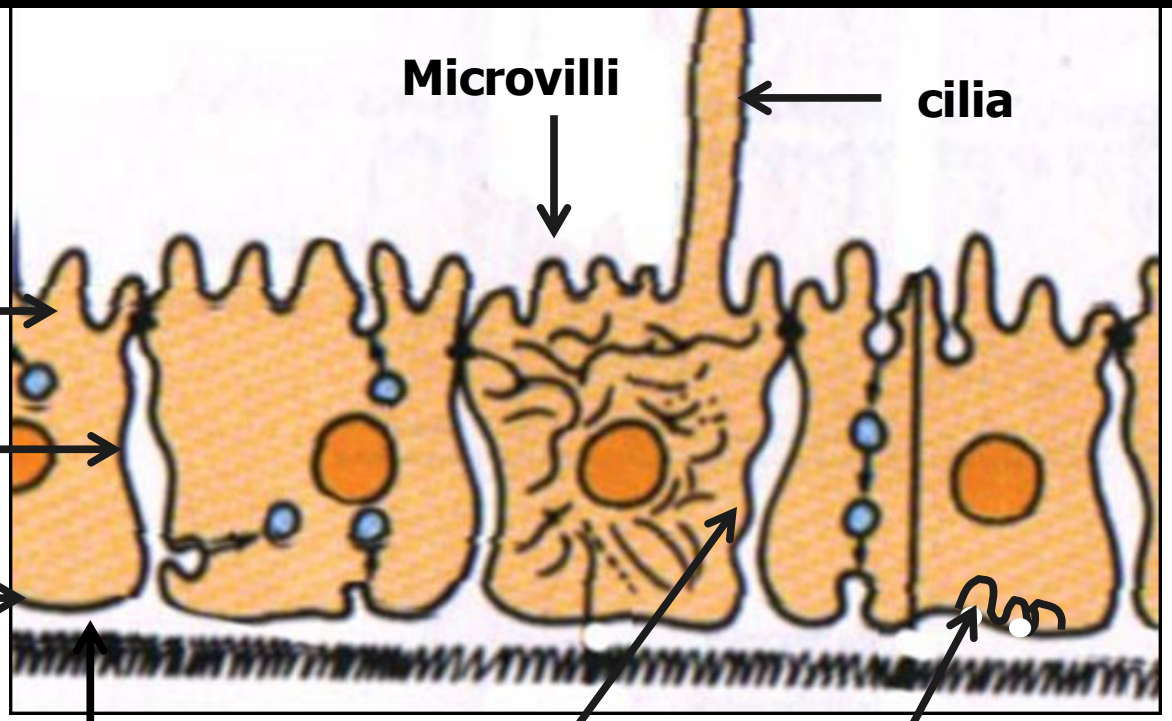


- Formed entirely of adherent cells
- Very little intercellular substance
- Fitted closely by cell junctions
- Avascular: nourished by diffusion
- Nerve supply – free nerve endings

Common features of Epithelia



Some Characteristics ….



Functional polarity …

Mechanical integrity …..

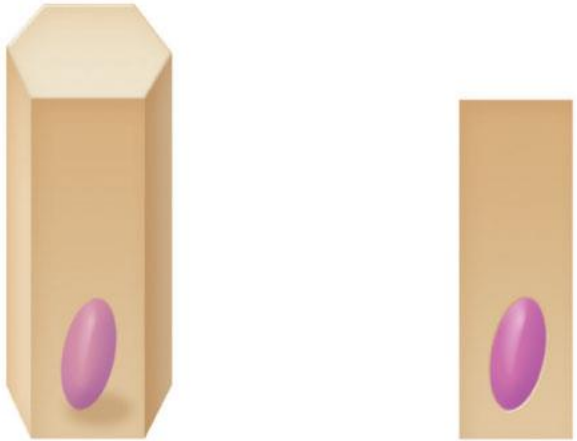
Epithelia vary in

- Cell shape
- Number of layers
- Type of adherence
- Mitotic activity
- Secretory or absorptive potential
- Adaptation to sensory perception

Squamous

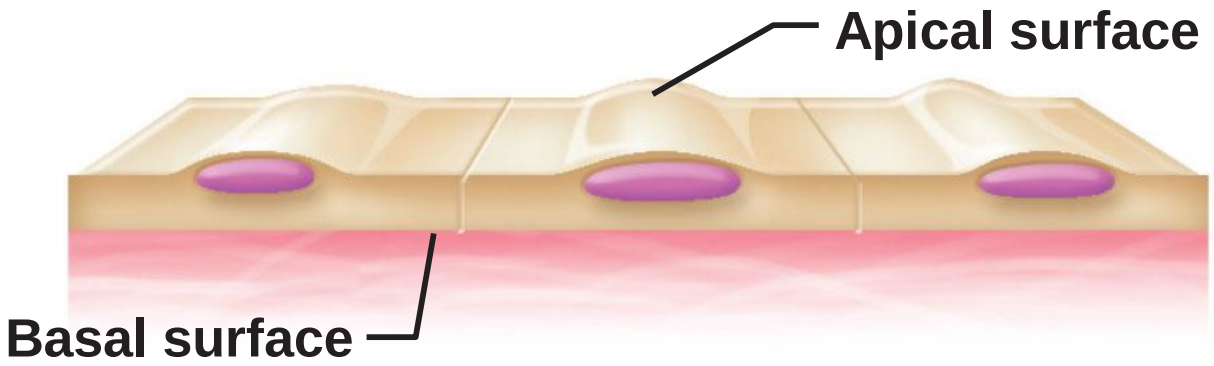
Cuboidal

Columnar

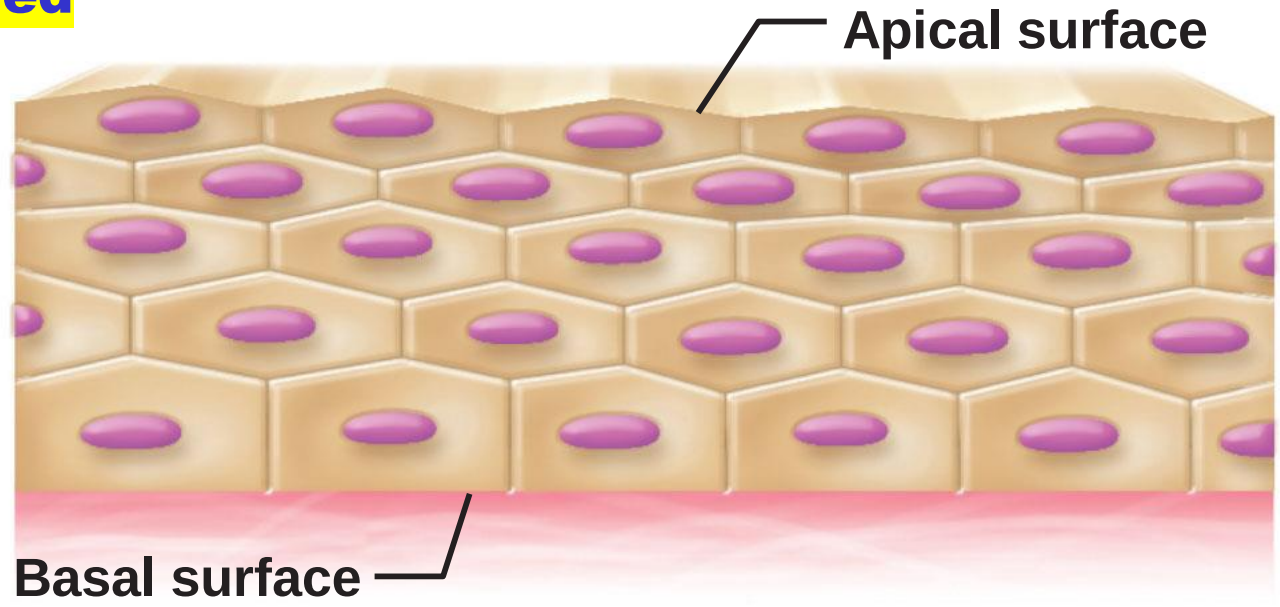


Classification based on cell shape

Simple



Stratified



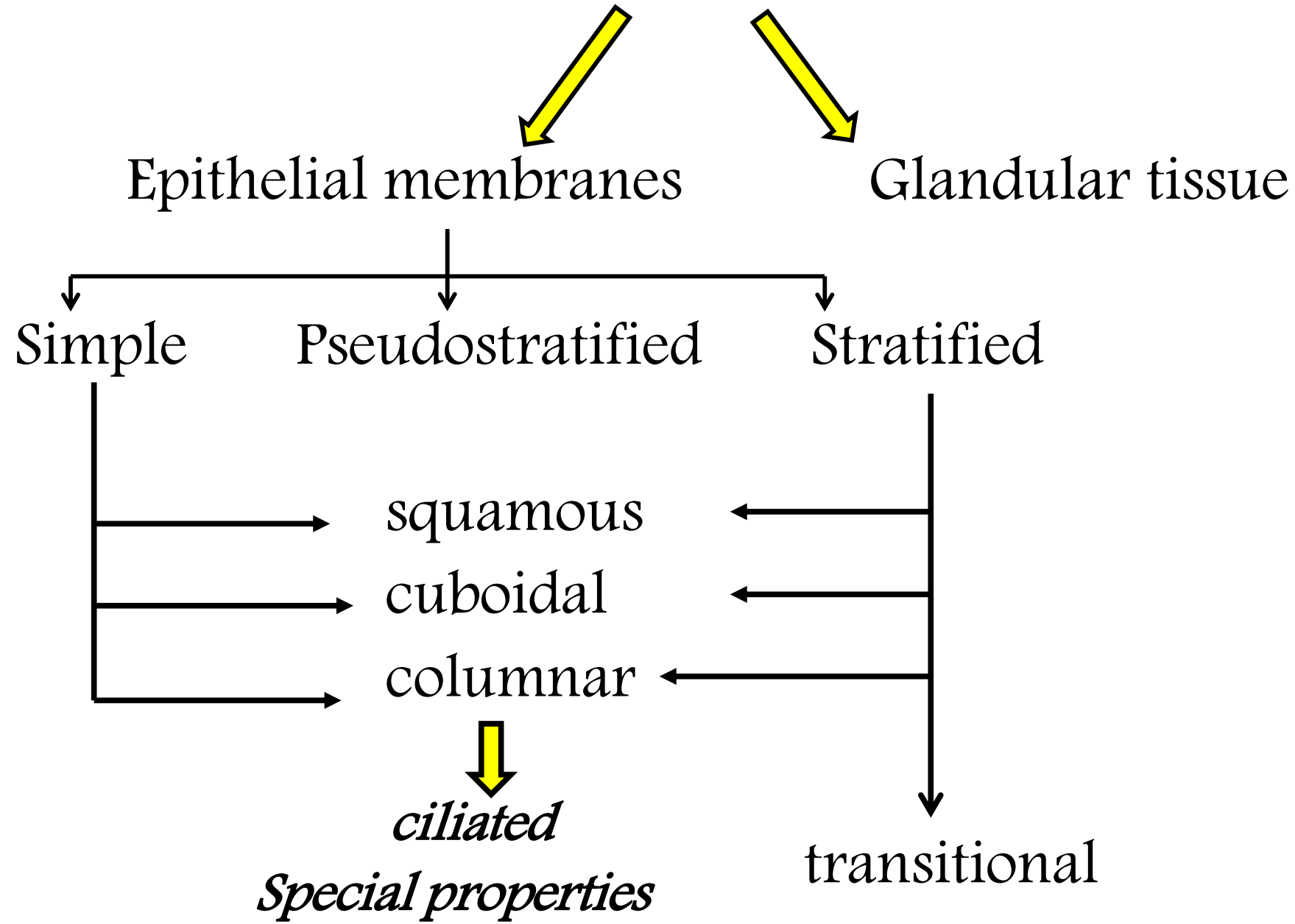
Classification based on number of cell layers

Epithelial Tissue Classification

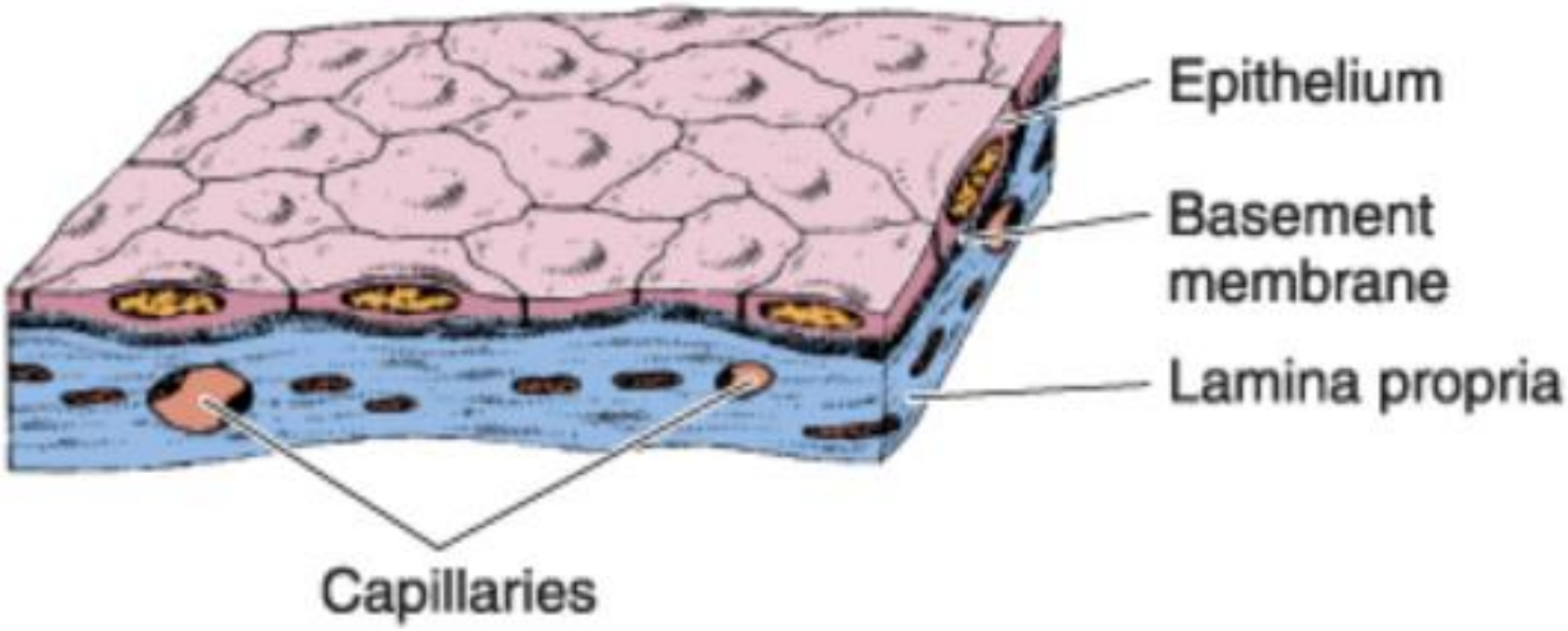
based on

Cell layers
+
Cell shapes
+
Specializations on apical surface

Epithelial Tissue Classification

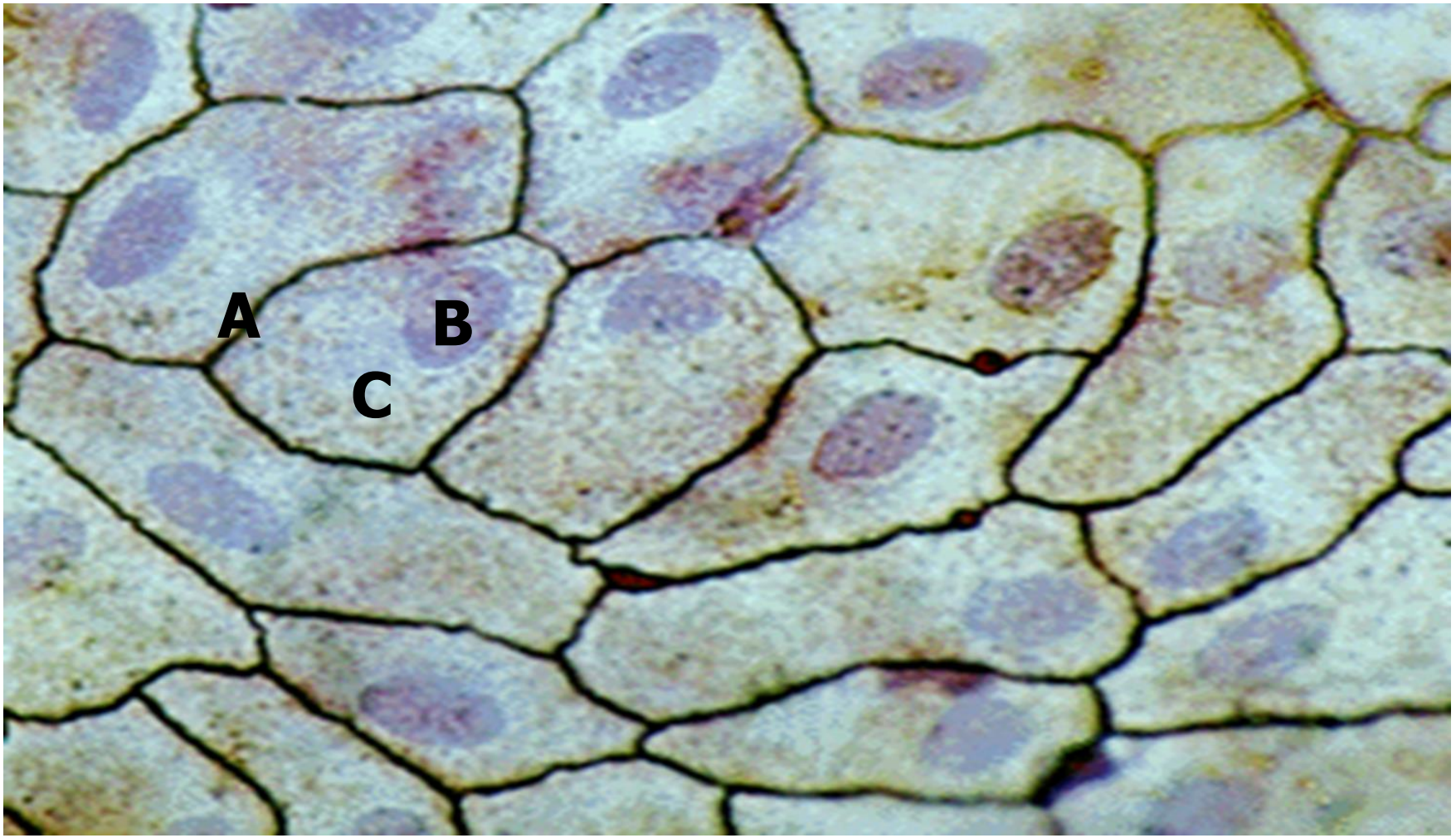


Simple squamous (pavement) epithelium



- single, thin flat scale like cells
- little cytoplasm
- nucleus bulge in the lumen

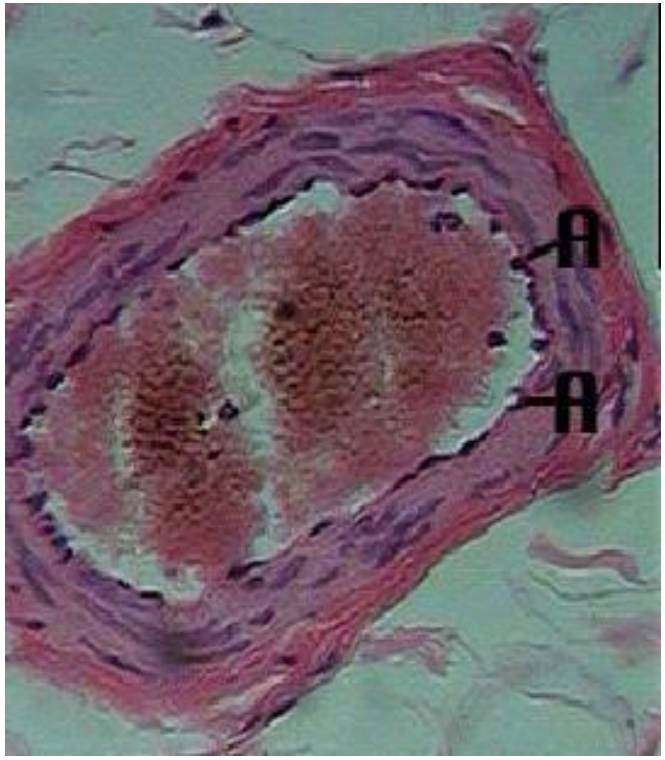
Apical View of Simple Squamous



A – cell membrane , B – nucleus , C - cytoplasm

Simple squamous epithelium

BC - Bowman's capsule (parietal layer) Pod - podocyte (visceral layer of Bowman's capsule)
MD - macula densa JG - juxtaglomerular cells DC - distal convoluted tubule



Cross-Sectional View of Blood Vessel

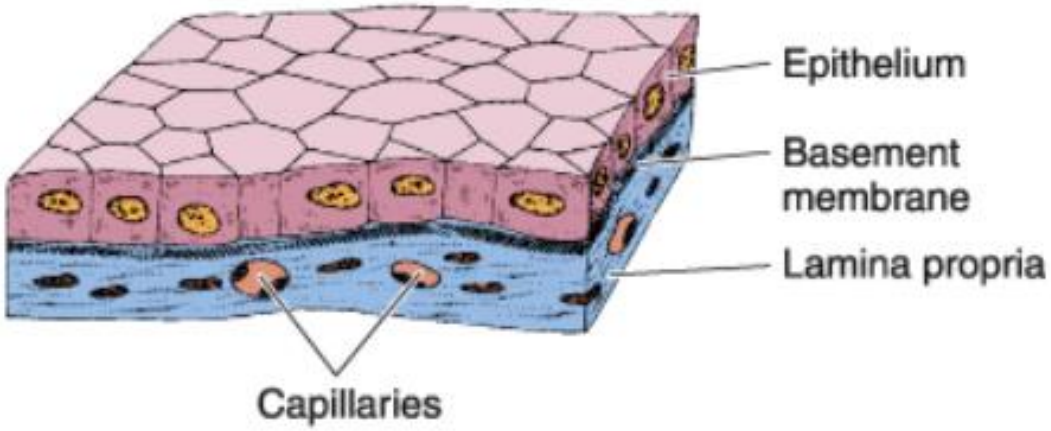
Simple squamous epithelium - Locations

- surfaces involved in passive diffusion → alveoli of lung
  - blood capillaries → endothelium
- lining body cavities → mesothelium
- subarachnoid and subdural spaces
- chambers of the eye

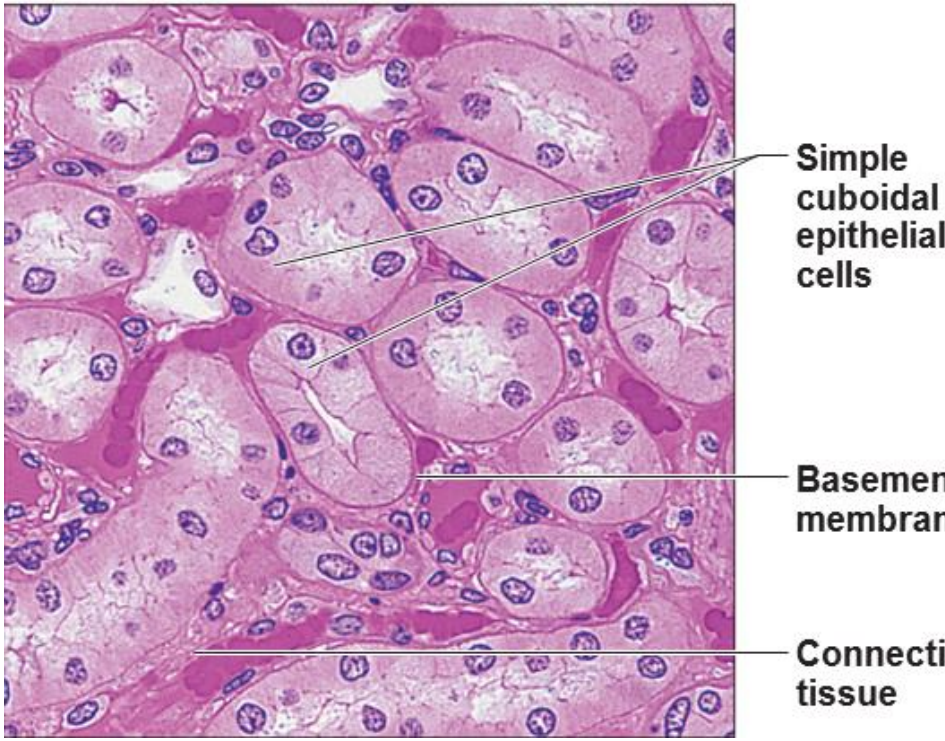
Simple squamous epithelium - Functions

- Facilitates the movement of the viscera (mesothelium)
- active transport by pinocytosis (mesothelium and endothelium)
- secretion of biologically active molecules (mesothelium).

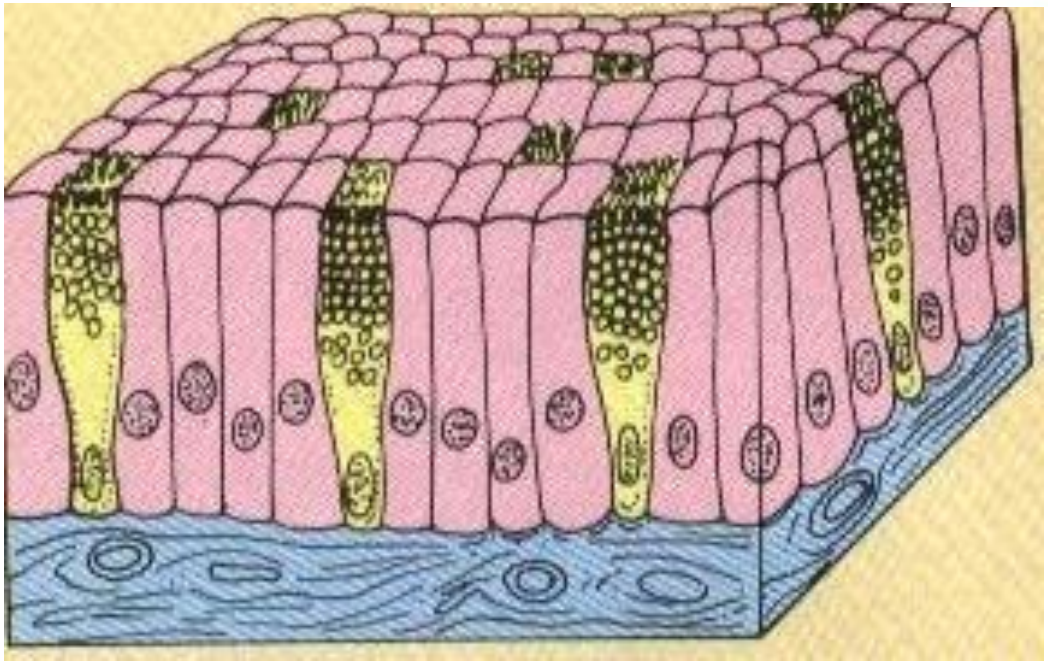
Simple cuboidal epithelium



- Functions:
  - secretion
  - excretion
- Locations:
  - Kidney tubules
  - Small ducts
  - secretory portions of small glands
  - ovary surface
  - Thyroid



Simple columnar epithelium



Simple columnar epithelium

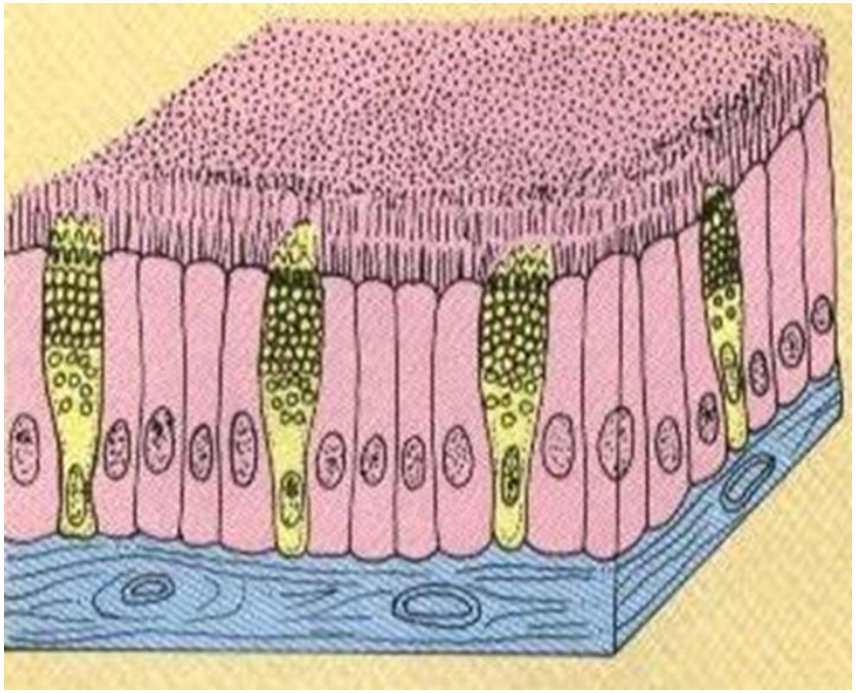
- Functions:

  Absorption & secretion

- Locations:

  Lining of intestine, gallbladder, bronchioles, stomach

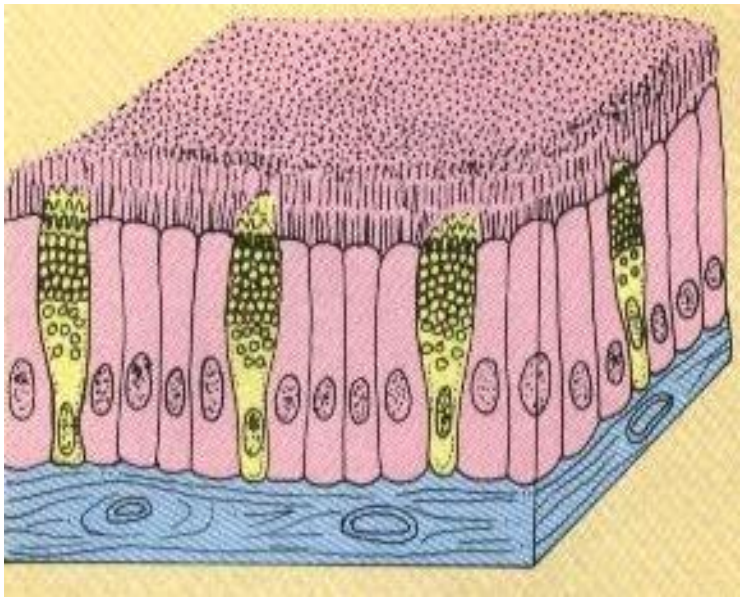
Simple columnar ciliated epithelium



- ciliated - cilia beat to move mucus along the surface.

- cilia are found on the luminal surface of most of the lining cells
- facilitates transport of the ova in **Uterine tube**

Simple columnar ciliated epithelium

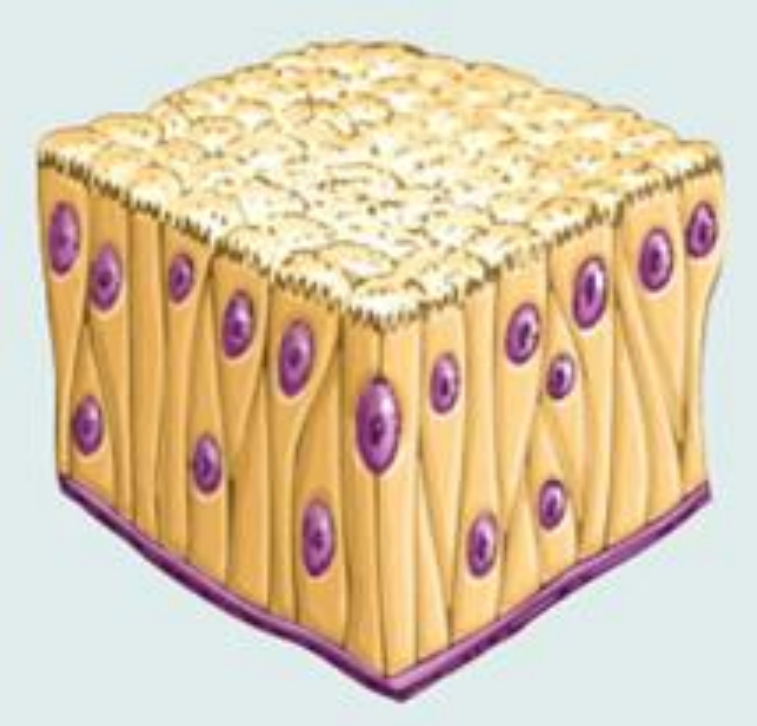


Nucleus

Cilia

Lumen

Pseudostratified columnar epithelium



- **Functions:**

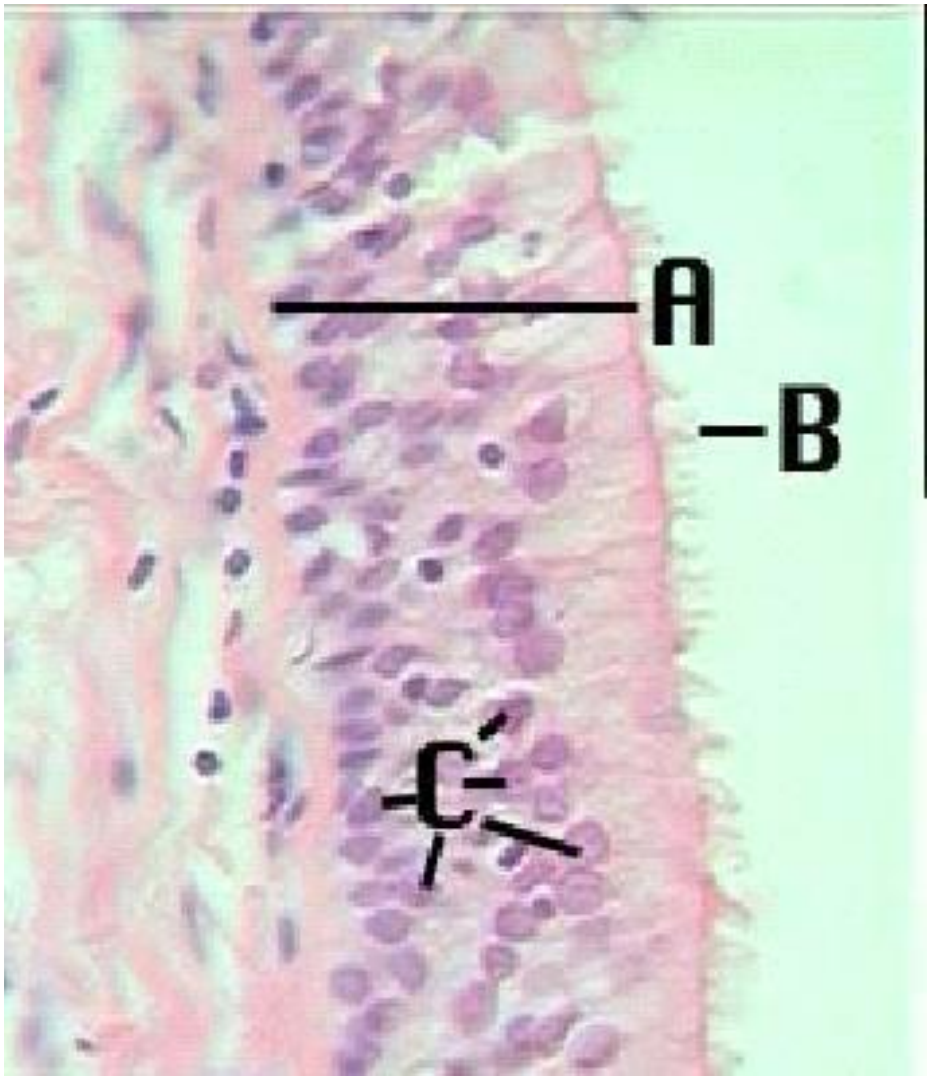
  Protection; cilia-mediated transport of particles rapped in mucus

- ***Locations:***
  - Lining of trachea
  - Bronchi
  - nasal cavity.

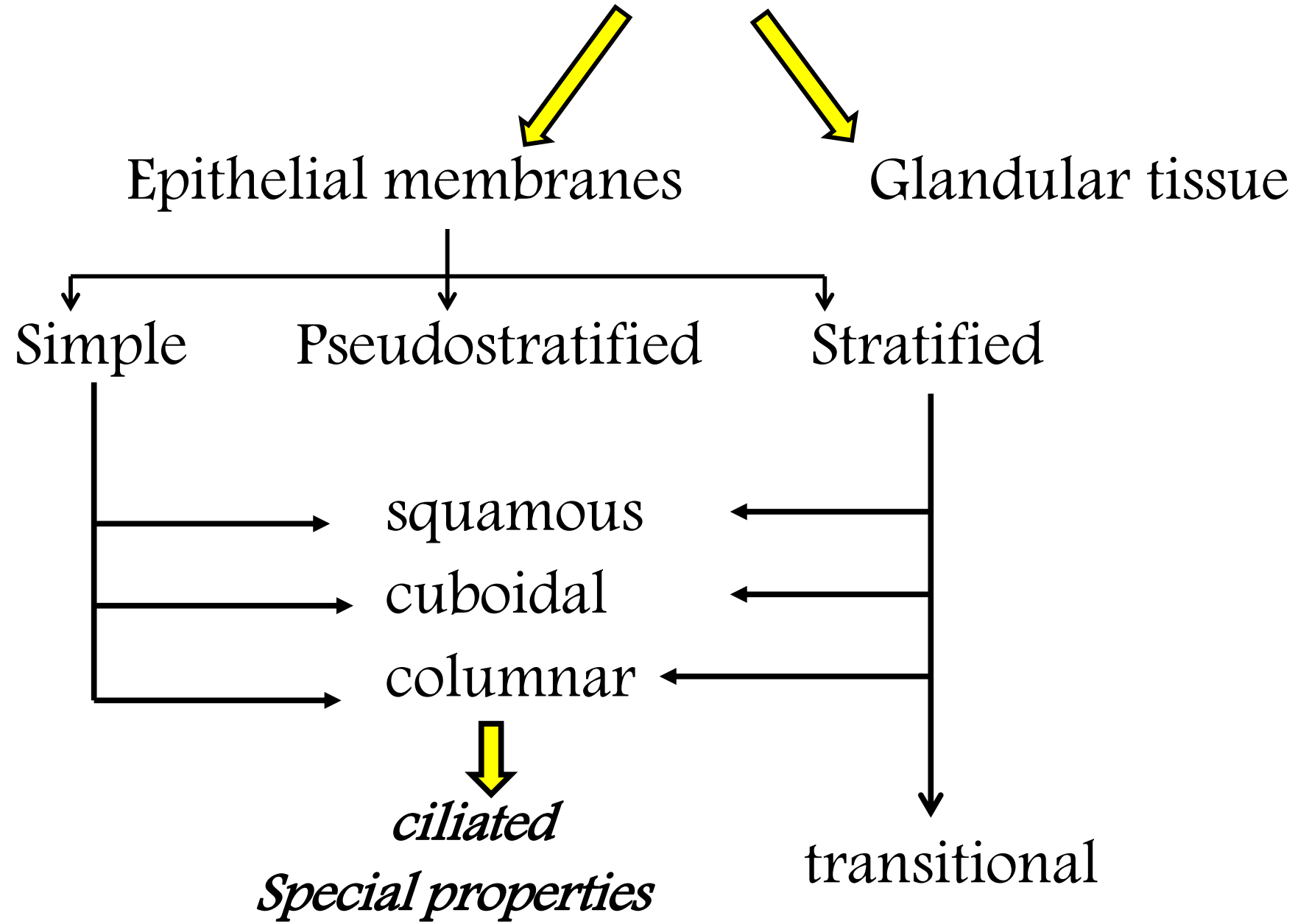
Pseudostratified columnar ciliated epithelium

Lining of the large airways

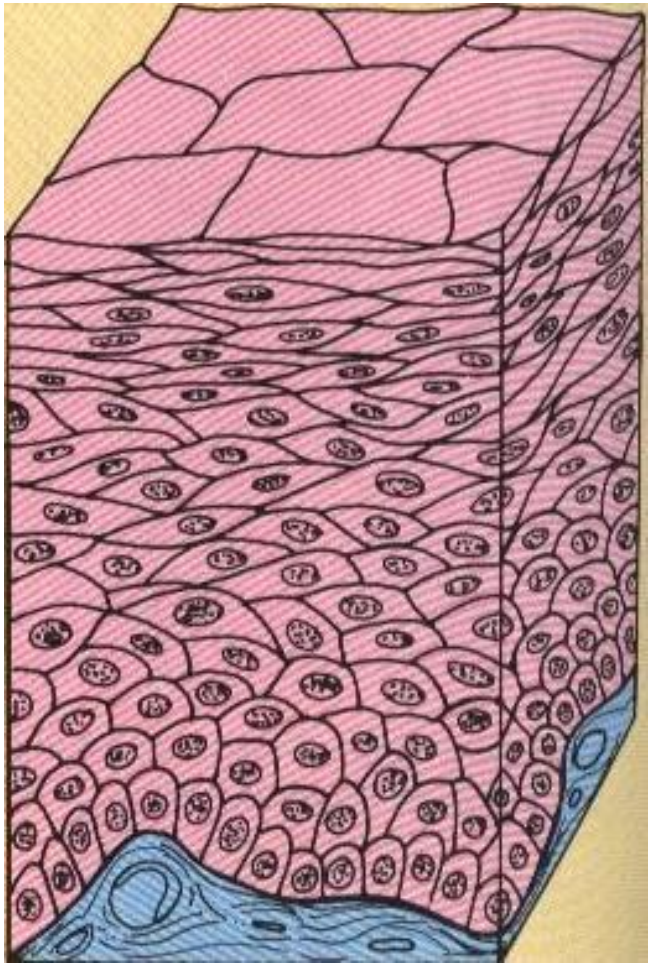
Line **A -** epithelium.
B- Cilia
C - Nuclei



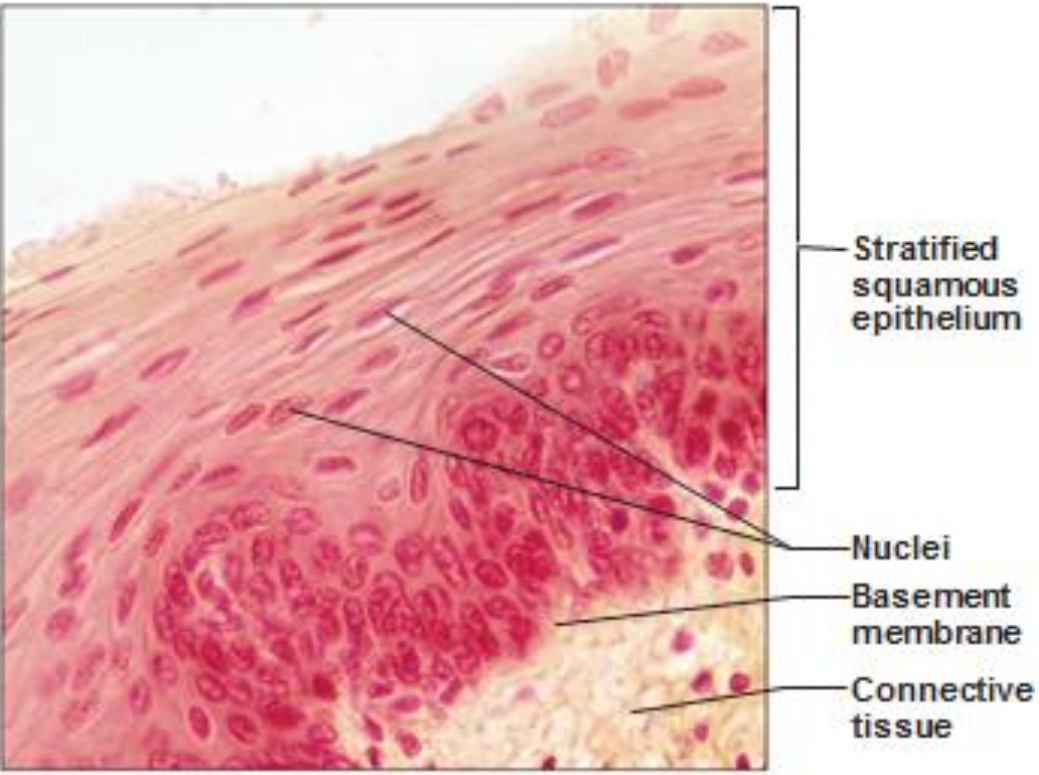
Epithelial Tissue Classification



Stratified squamous epithelium



Non keratinised stratified squamous (wet) epithelium



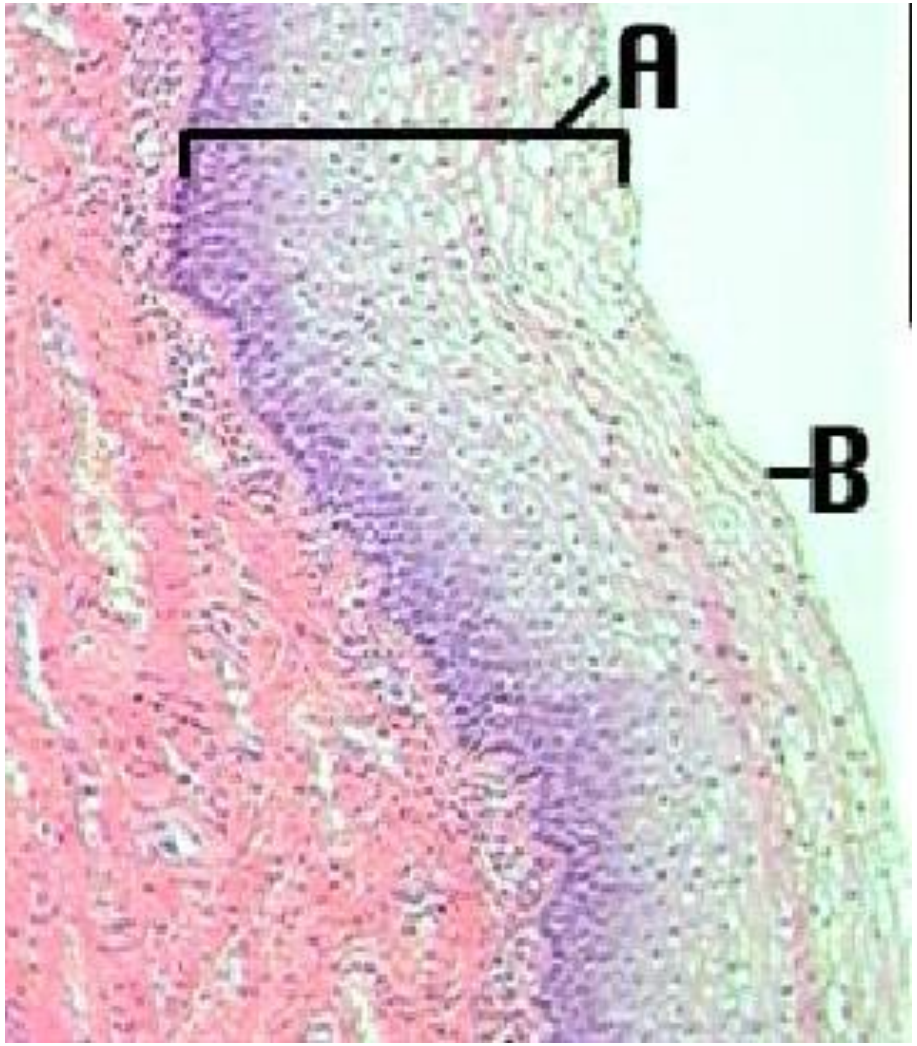
- **Functions:**

  Protection, secretion; prevents water loss

- ***Locations:***
  - Mouth
  - Oesophagus
  - Larynx
  - Vagina
  - Anal canal

Non keratinised stratified squamous (wet) epithelium

- A - epithelium
- B – surface nuclei



keratinised stratified squamous (dry) epithelium

- found in parts of the body exposed to the atmosphere.
- covered with waterproof coating – keratin.
- palms and soles

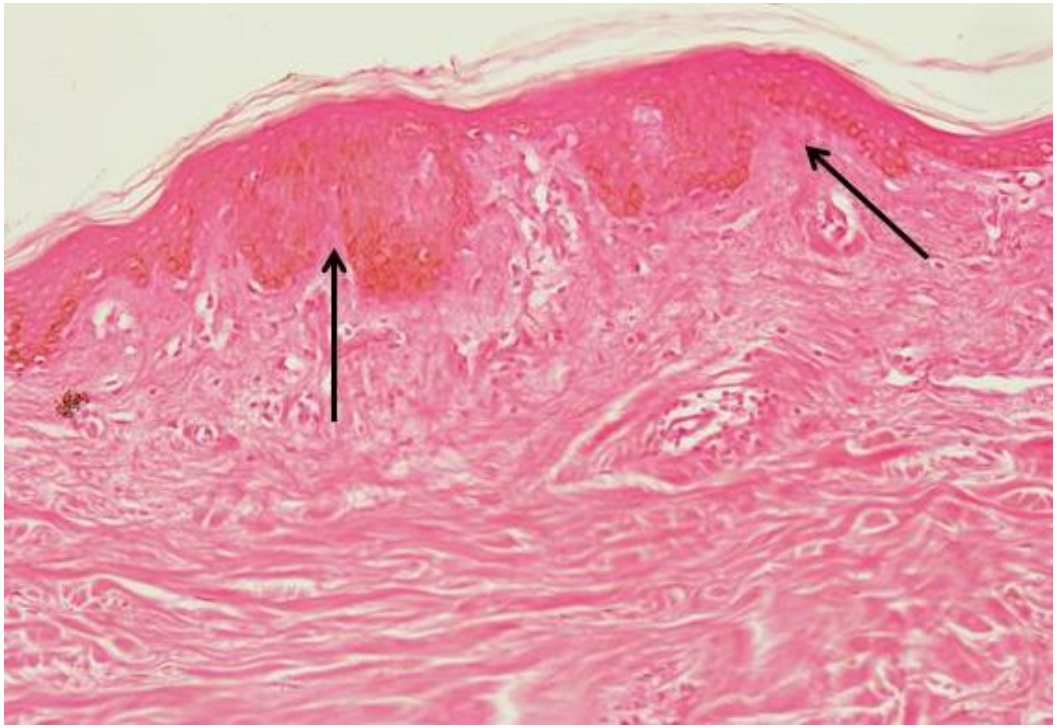
↓

thick keratin

protects from

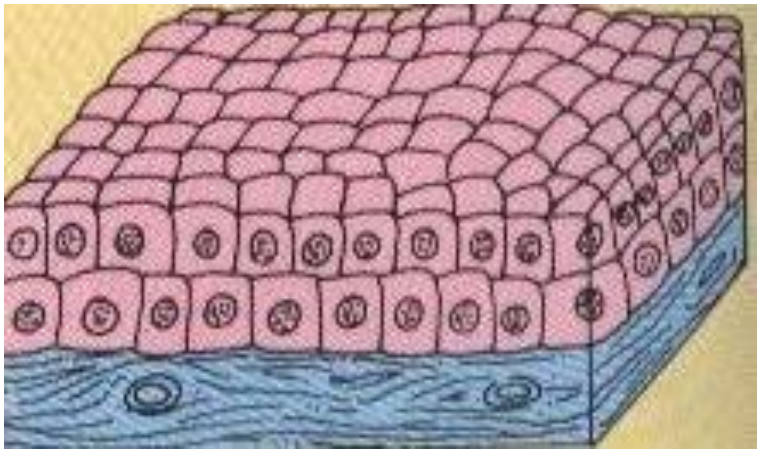
↓

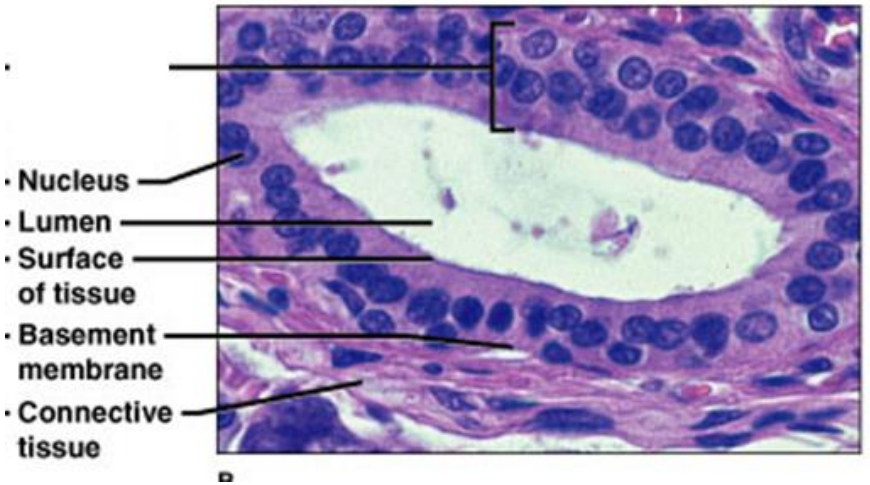
abrasion and desiccation.



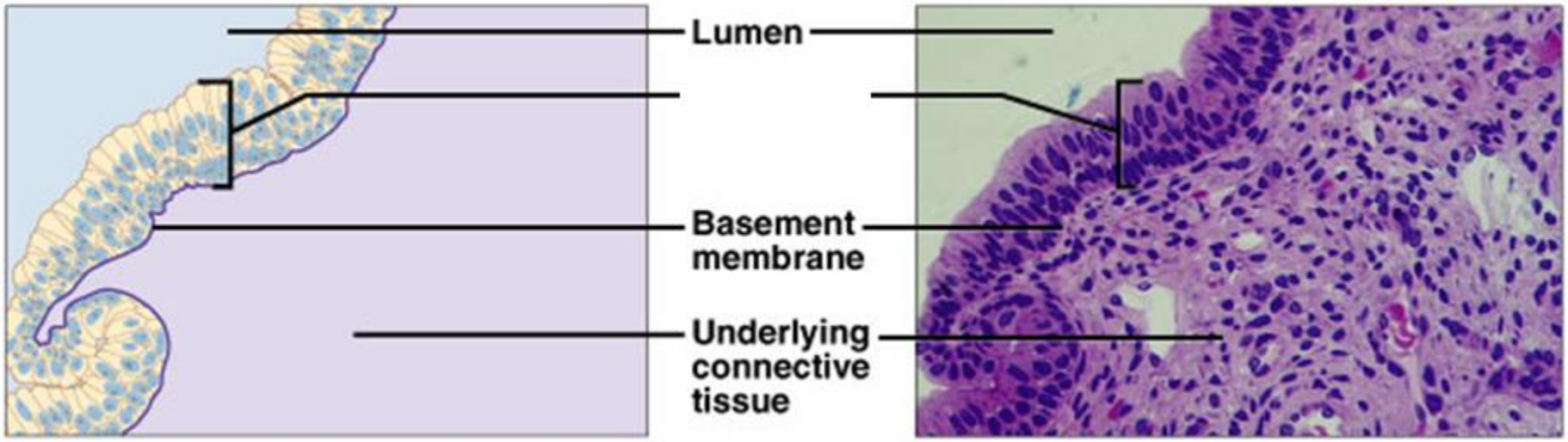
Stratified cuboidal epithelium

- 2-3 layers thick
- large ducts of exocrine glands → salivary glands
  → sweat glands
- more protection than that given by a simple epithelium is needed
- no significant absorptive or secretory function.





Stratified columnar epithelium

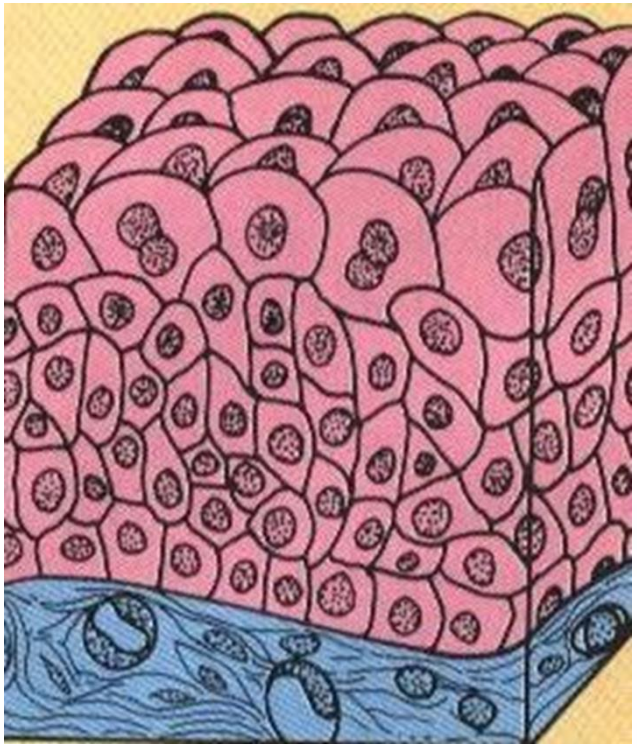


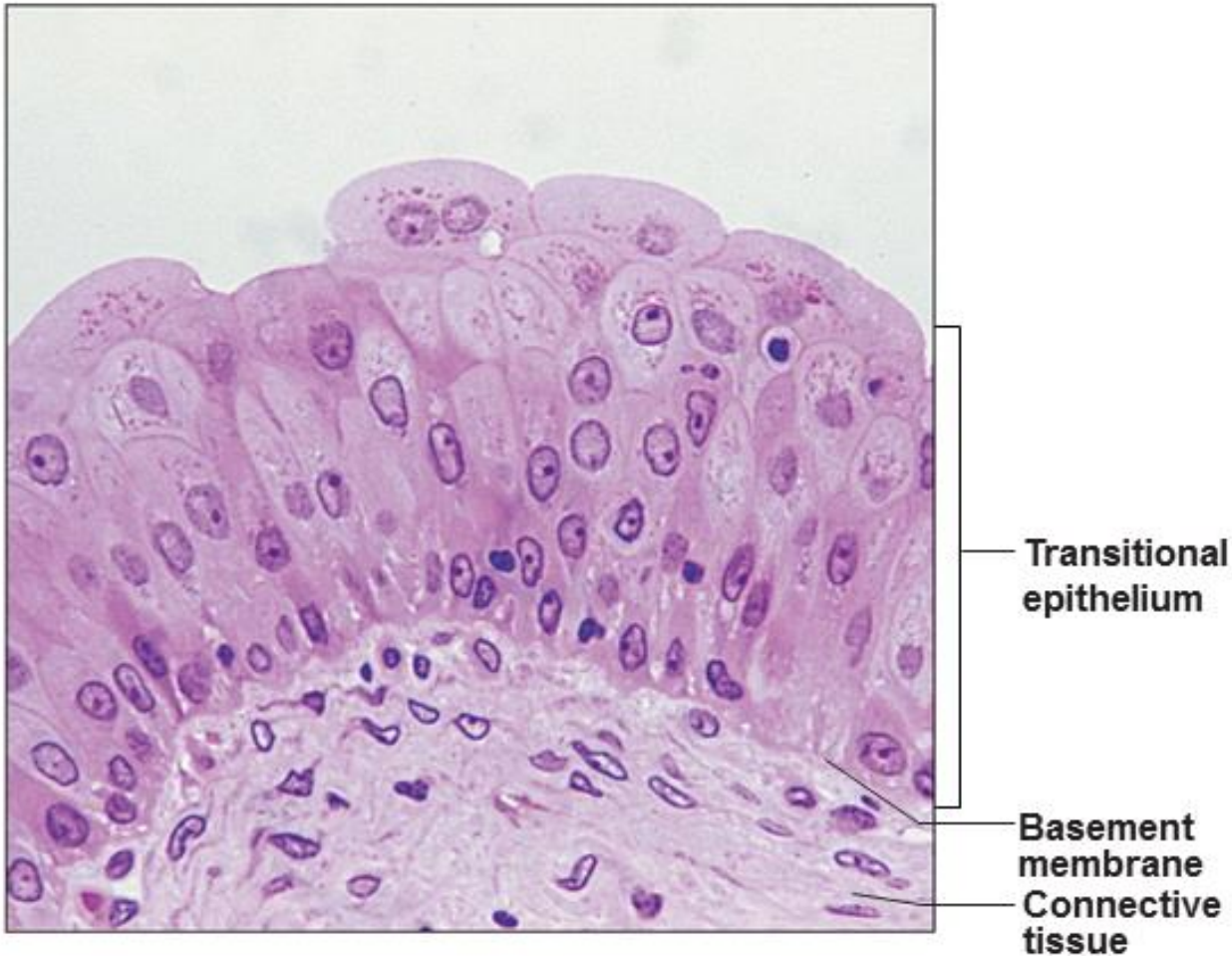
- 2-3 layers thick
- Very rare
- more protection
- male reproductive system & conjunctiva

Transitional epithelium

- found in the urinary tract:
- specialized to → stretch (distensibility)
  → withstand the toxicity of urine. (Protection)
- made up of 5-6 layers of cells.
- In a relaxed state → superficial cells
  → large
  → rounded
  → pale stained
- luminal surface → scalloped outline
- thick plates separated by narrow bands of thin membrane

Transitional epithelium



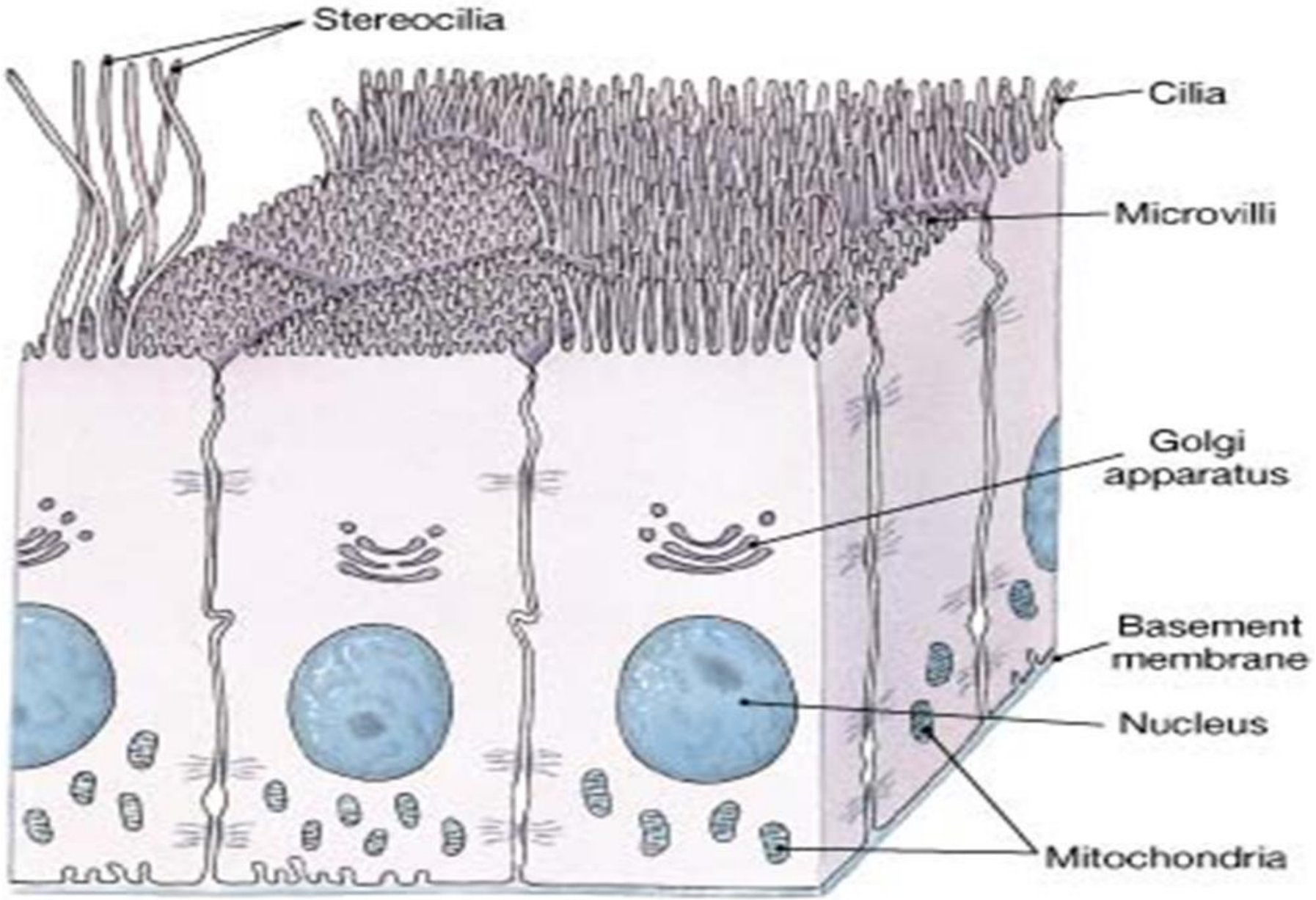


Transitional epithelium

- Tight junctions between the surface epithelial cells prevent intercellular diffusion
- In the deeper layers desmosomes are fewer
- Numerous interdigitations and infoldings
- Bladder, ureters, renal calyces

SUMMERY

SUMMERY

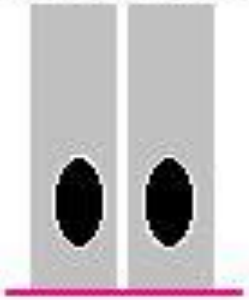

Stereocilia
Cilia
Microvilli
Golgi apparatus
Basement membrane
Nucleus
Mitochondria

SUMMERY

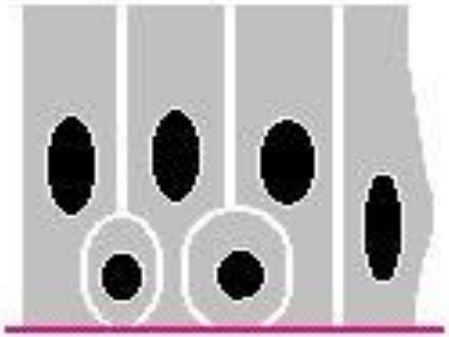
SIMPLE SQUAMOUS

SIMPLE CUBOIDAL

SIMPLE COLUMNAR

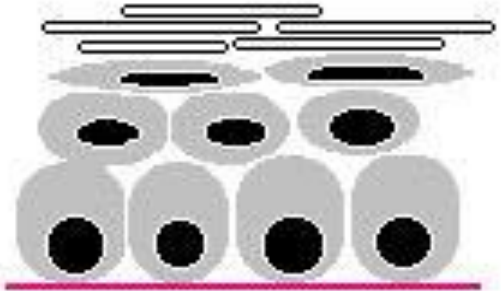


PSEUDOSTRATIFIED COLUMNAR



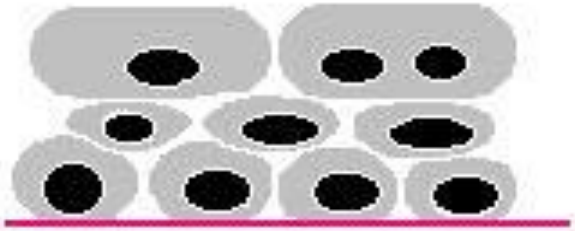
STRATIFIED SQUAMOUS

STRATIFIED SQUAMOUS KERATINIZED



STRATIFIED CUBOIDAL

TRANSITIONAL



SUMMERY

Type	Cell Form	Examples of Distribution	Main Function
Simple	Squamous	Lining of vessels (endothelium).	Facilitates the movement of the viscera (mesothelium), active transport by pinocytosis (mesothelium and endothelium), secretion of biologically active molecules (mesothelium).
		Serous lining of cavities; pericardium, pleura, peritoneum (mesothelium).	
	Cuboidal	Covering the ovary, thyroid.	Covering, secretion.
	Columnar	Lining of intestine, gallbladder.	Protection, lubrication, absorption, secretion.
Pseudostratified	Some columnar and some cuboidal	Lining of trachea, bronchi, nasal cavity.	Protection, secretion; cilia-mediated transport of particles trapped in mucus.
Stratified	Surface layer squamous keratinized (dry)	Epidermis.	Protection; prevents water loss.
	Surface layer squamous nonkeratinized (moist)	Mouth, esophagus, larynx, vagina, anal canal.	Protection, secretion; prevents water loss.
	Cuboidal	Sweat glands, developing ovarian follicles.	Protection, secretion.
	Transitional: domelike to flattened, depending on the functional state of the organ	Bladder, ureters, renal calyces.	Protection, distensibility.
	Columnar	Conjunctiva.	Protection.

REFFERENCES

- **Junqueira**, L.C., Carneiro (1998). **Basic histology**. 9 th ed., stamford: Appleton & lange

- Burkit, H.G, young, B. (1993). **Wheaters functional histology**. 4 th ed., london:Churchill livingstone


Thank you