

EPITHELIUM

CLASSIFICATIONS & FUNCTIONS

BY

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Human organization

1. **Cell:** they are the functional unit of the body.
2. **Tissue:** consists of cells and intercellular substance.
3. **Organ:** consists of different tissues which have related function.
4. **System:** consists of different organs which have related function.

Human Tissues

- **Epithelial tissue**
- **Connective tissue**
- **Muscle tissue**
- **Nervous tissue**

Epithelium : It is a sheet of cells that covers the external surface of any solid structure & the internal surface of any hollow tubular structure.

General characteristics of epithelium

- Epithelium is the 'cellular sheet' made of either single layer or many layer of cells.
- Epithelial cells are adherent to each other by means of junctional complexes.
- Epithelium rests on a basement membrane.
- The superficial surface of epithelium is free & is exposed to air or fluid.
- Everything that enters or leaves the body has to cross an epithelial sheet/layer.

- Epithelium is derived from all 3 germs layers.

Skin – ectoderm

Cardiovascular system – mesoderm

Respiratory & Digestive systems –endoderm

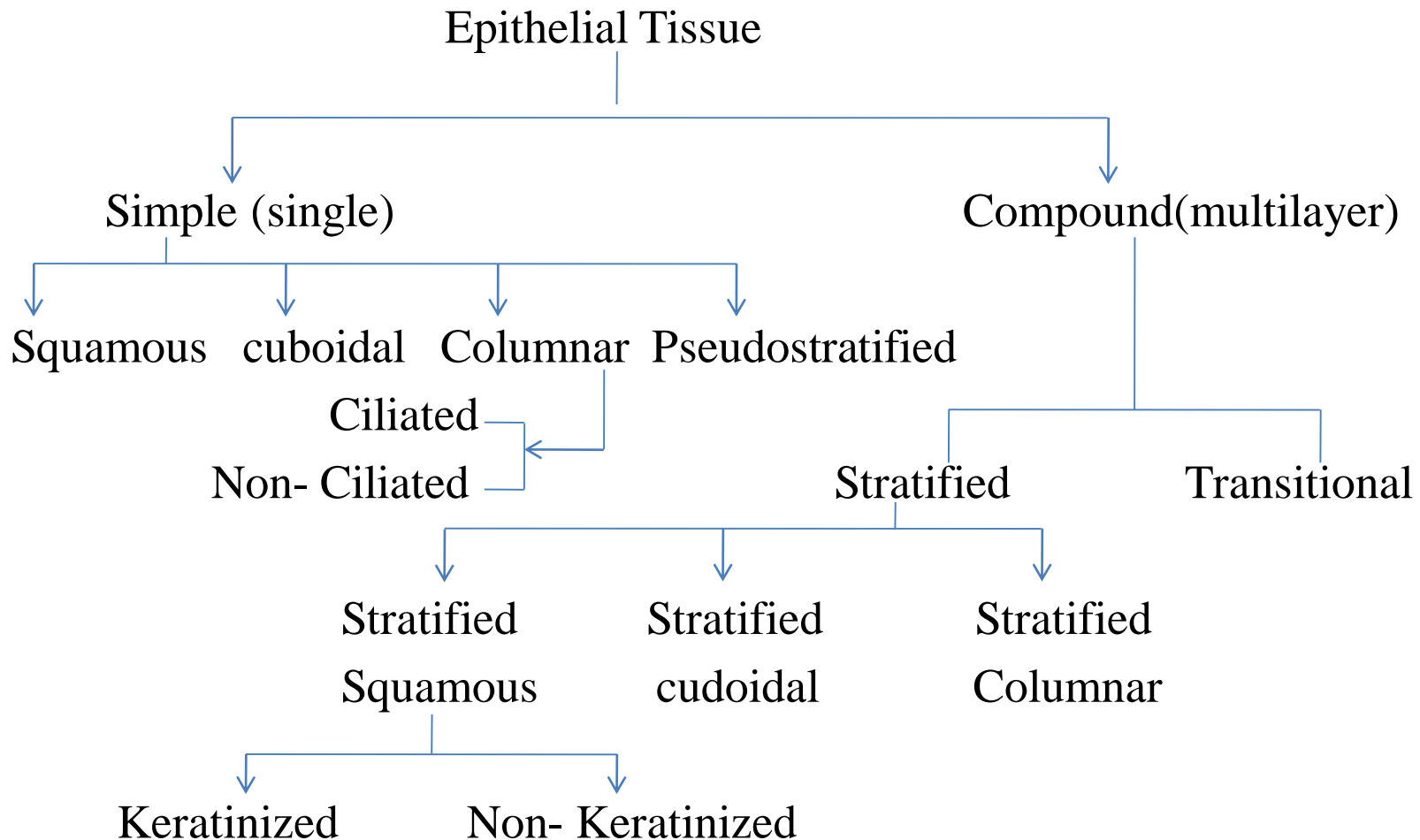
- No blood vessels nor lymphatics are found in epithelium.
- Nourishment is provided by diffusion.

Function of Epithelium

- Protection : Skin provide protection of the body from external environment.
- Absorption : Epithelial lining of alimentary tract allows absorption of the digested food stuff.
- Secretion : Goblet cells of AT & RT secrete mucus, which provides protection & minimizes friction of the passages.
- Sensation (eg- gustatory, olfactory)
- Contractility (eg- mammary glands)
- Excretion (eg- DCT of kidney)

Classification Of Epithelial Tissue

A. Based on layer of cell

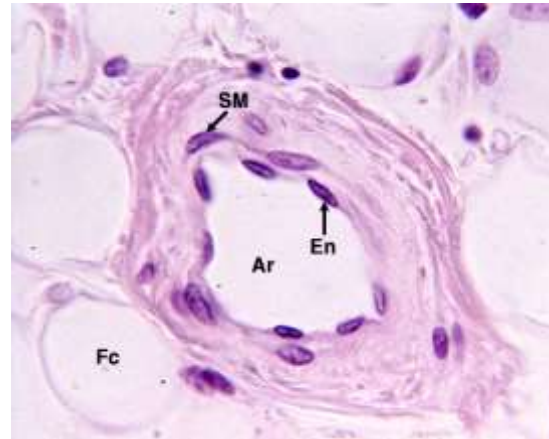
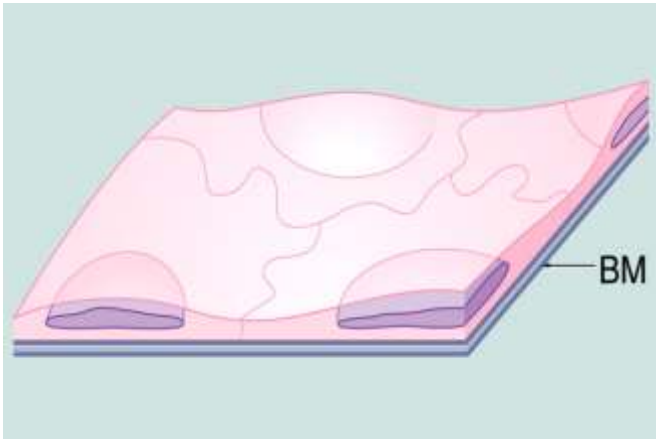


B. Based on Shape of the cells

- a) Squamous epithelia
- b) Cuboidal epithelia
- c) Columnar epithelia

1. Simple Squamous epithelia

Description: Single layer of flat cells with disc-shaped central nuclei.



Function: Allows passage of material by diffusion & filtration (Active transport)

Localization

Simple Squamous epithelium

Endothelium : heart, blood vessels, lymph vessels

Mesothelium : Pericardium, pleura
peritoneum

others: alveoli of the lungs, loops of Henle of the nephrons etc.

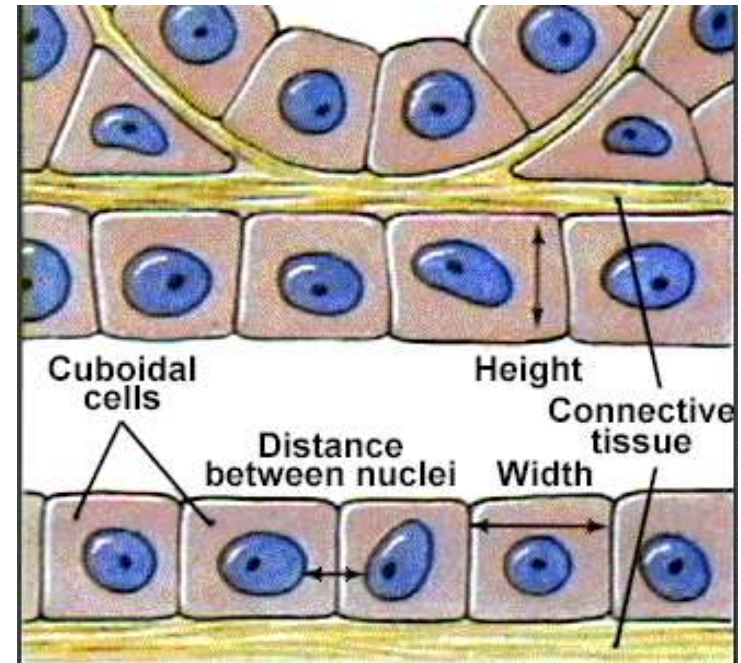
2.Simple Cuboidal Epithelium

Location:

kidney tubules, thyroid follicles,
Germinal layer of ovary.

Function:

- Secretion
- Absorption



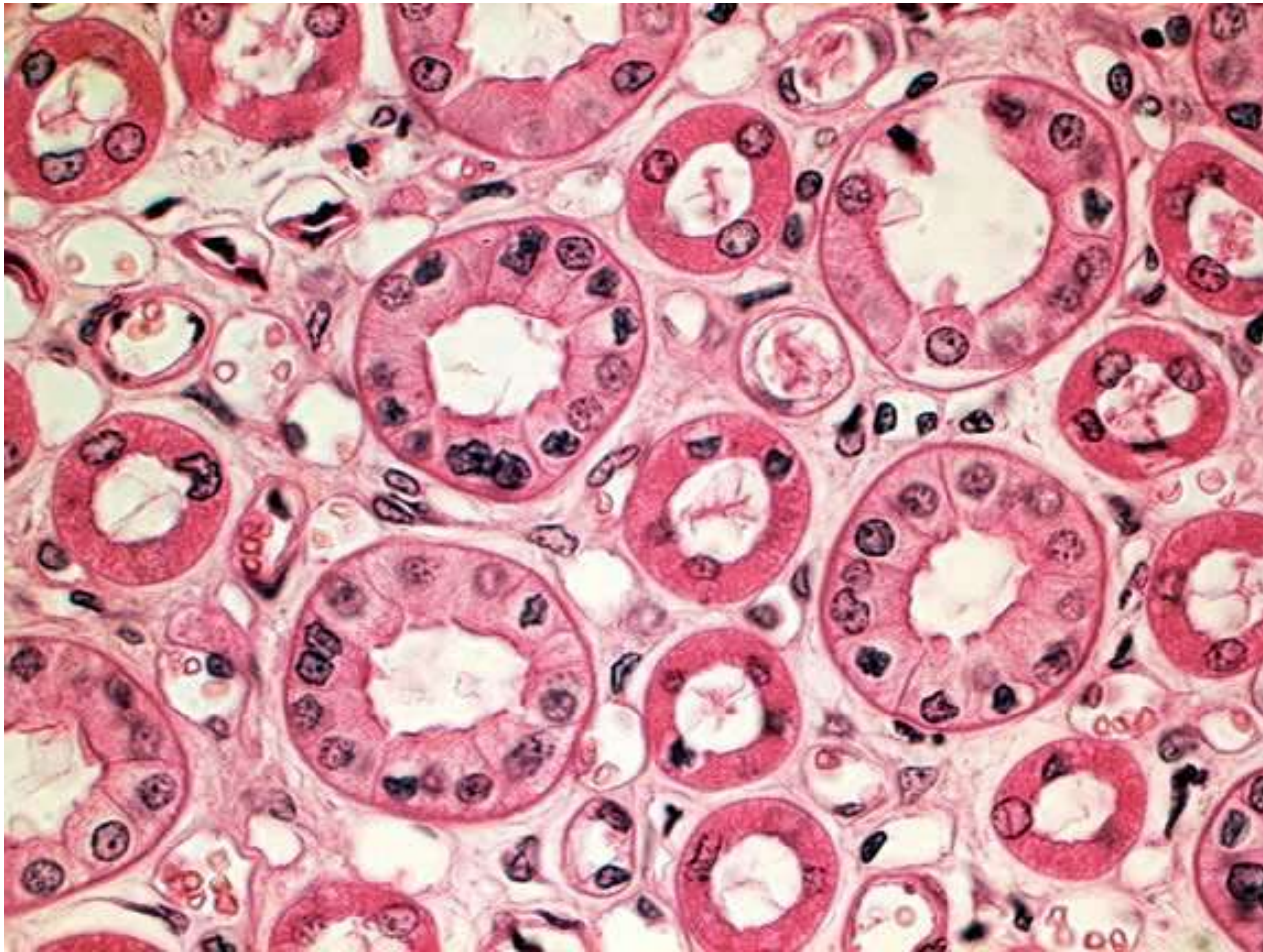
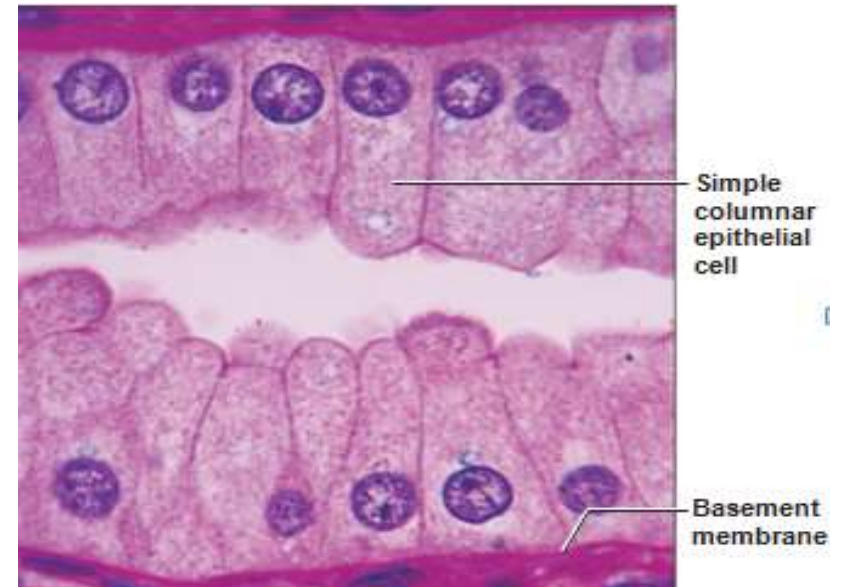
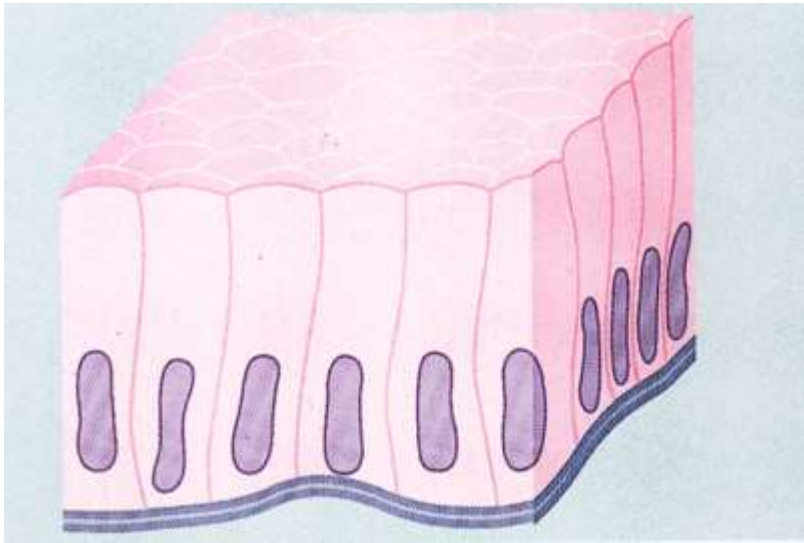


Fig: Simple Cuboidal (cross section)

3a. Simple columnar(Non-ciliated)

Description: Single layer of **columnar** cells with **oval** nuclei ;



Function: absorption of nutrients,
secretion of mucus & enzymes.

Locations: Stomach, Intestine , Gall bladder.

3b.Simple columnar(Ciliated)

- Cells are tall, column-like with cilia.

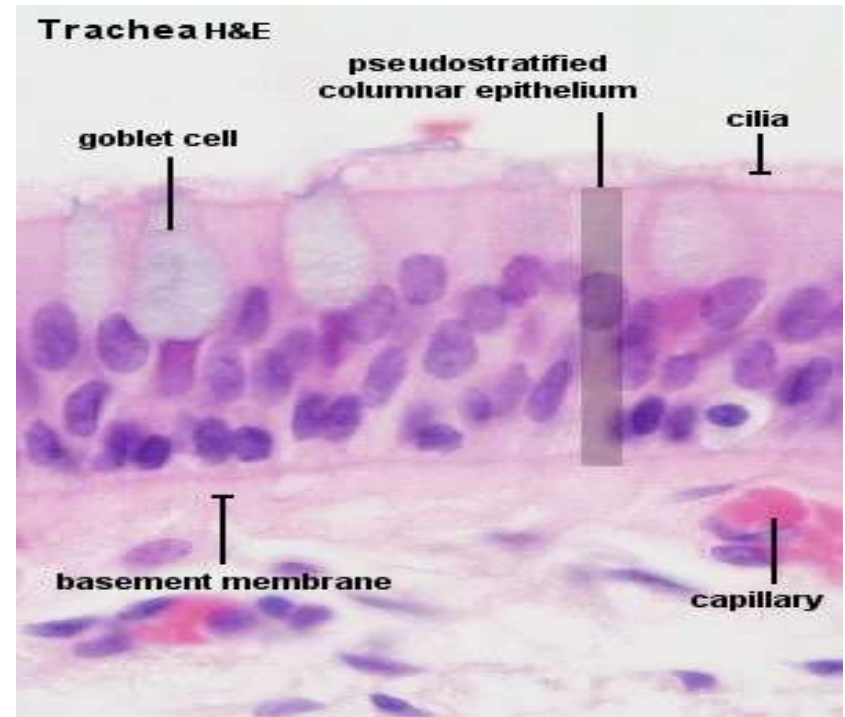
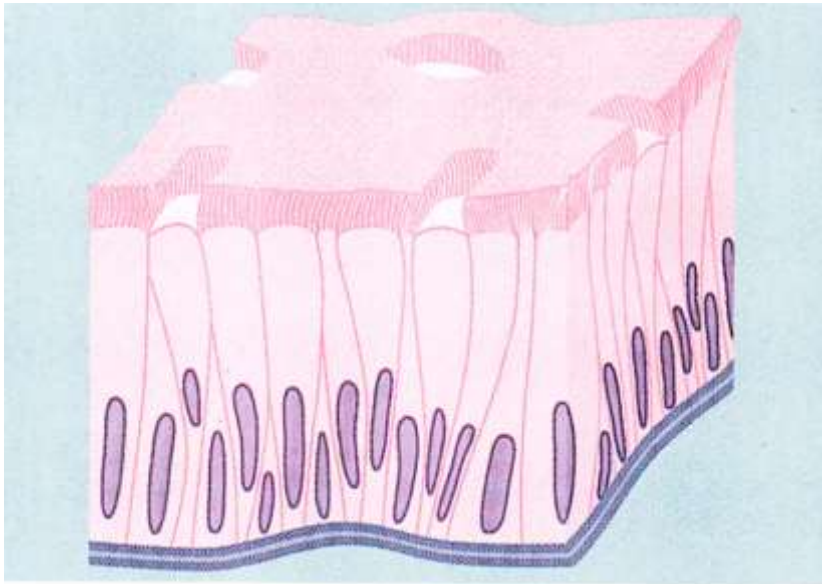
Function: Transport
Secretion

Locations: Uterine tube

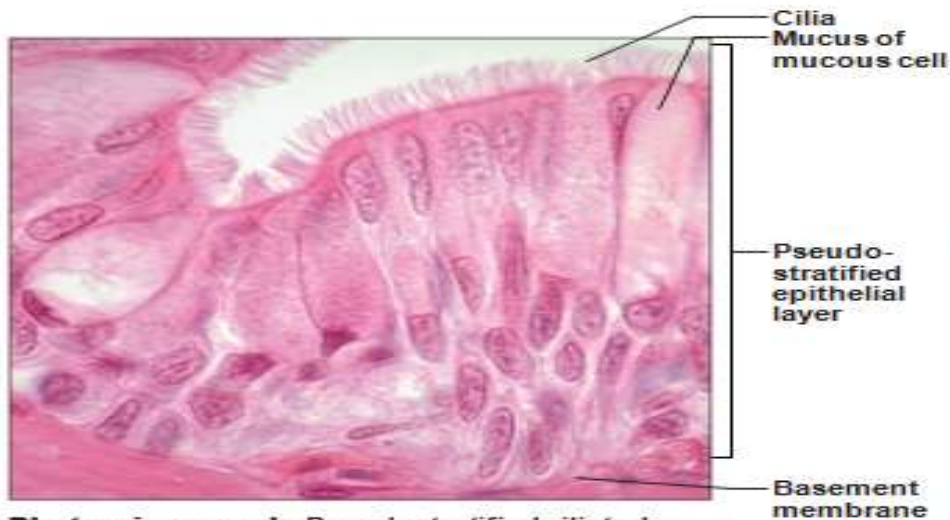


4. Pseudostratified columnar epithelium (ciliated)

- **Description:** single layer of cells of differing heights, resting on a common basement membrane, but all cells do not reach the free surface.
- Nuclei are seen at many different levels.
- They contain goblet cells and cilia.



- **Function:** Secretion, particularly of mucus; propulsion of mucus by ciliary action.
- **Locations:** Nasal cavity, Trachea, Bronchus.



Photomicrograph: Pseudostratified ciliated columnar epithelium lining the human trachea (570x).

Compound epithelium:

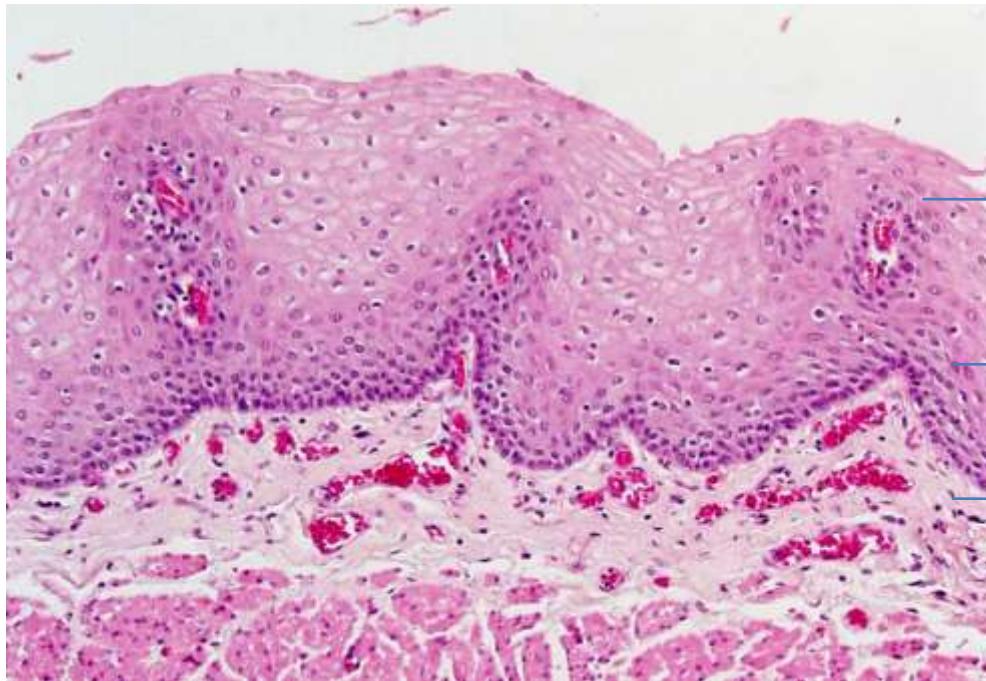
a. Stratified Squamous epithelium

Description: multiple layers of cells.

Surface cells are flattened.

Intermediate cells are polyhedral.

Basal cells: cuboidal or columnar;



→ Squamous cell

→ Polyhedral cell

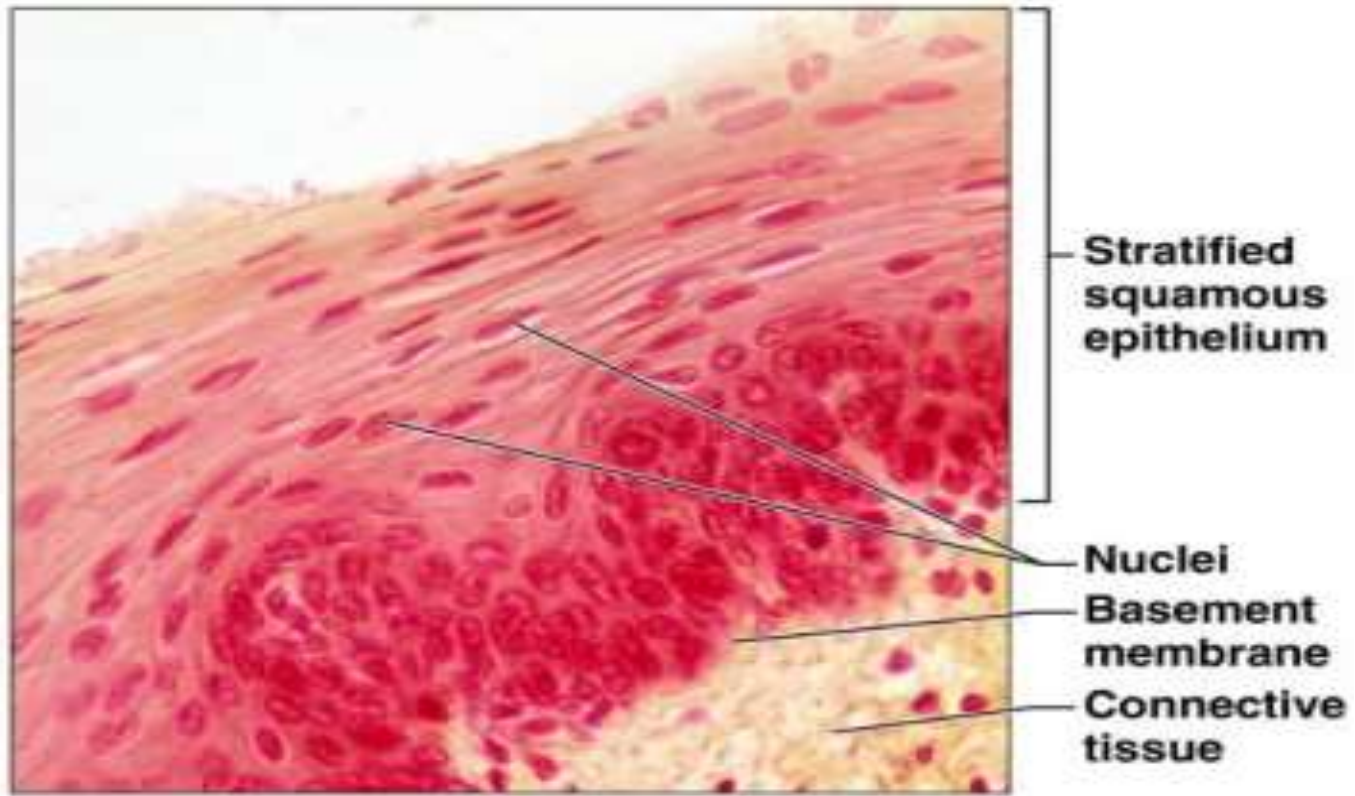
→ Columnar basal cell

Function: Protects underlying tissues in areas subjected to abrasion.

Stratified Squamous epithelium: 2 types

1. Stratified Squamous Non-Keratinized epithelium

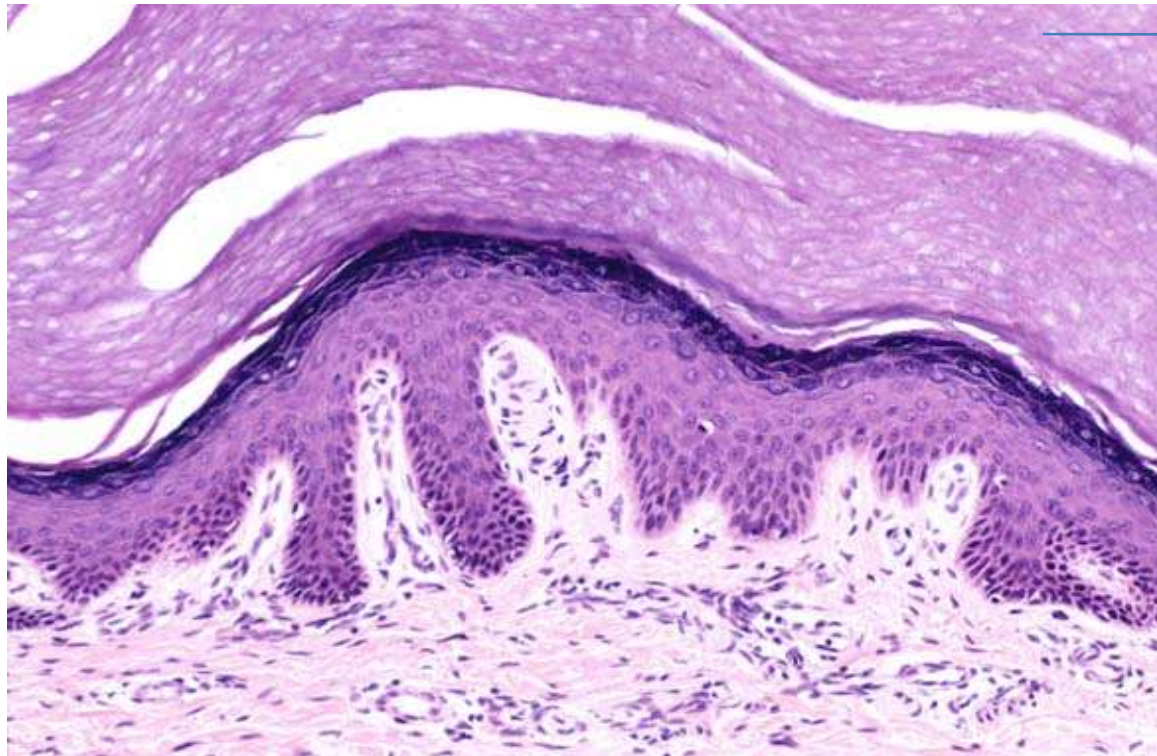
Locations: Mouth cavity, oesophagus , vagina, Anal canal etc.



Photomicrograph: Stratified squamous epithelium lining the esophagus (425×).

2. Stratified Squamous Keratinized epithelium:

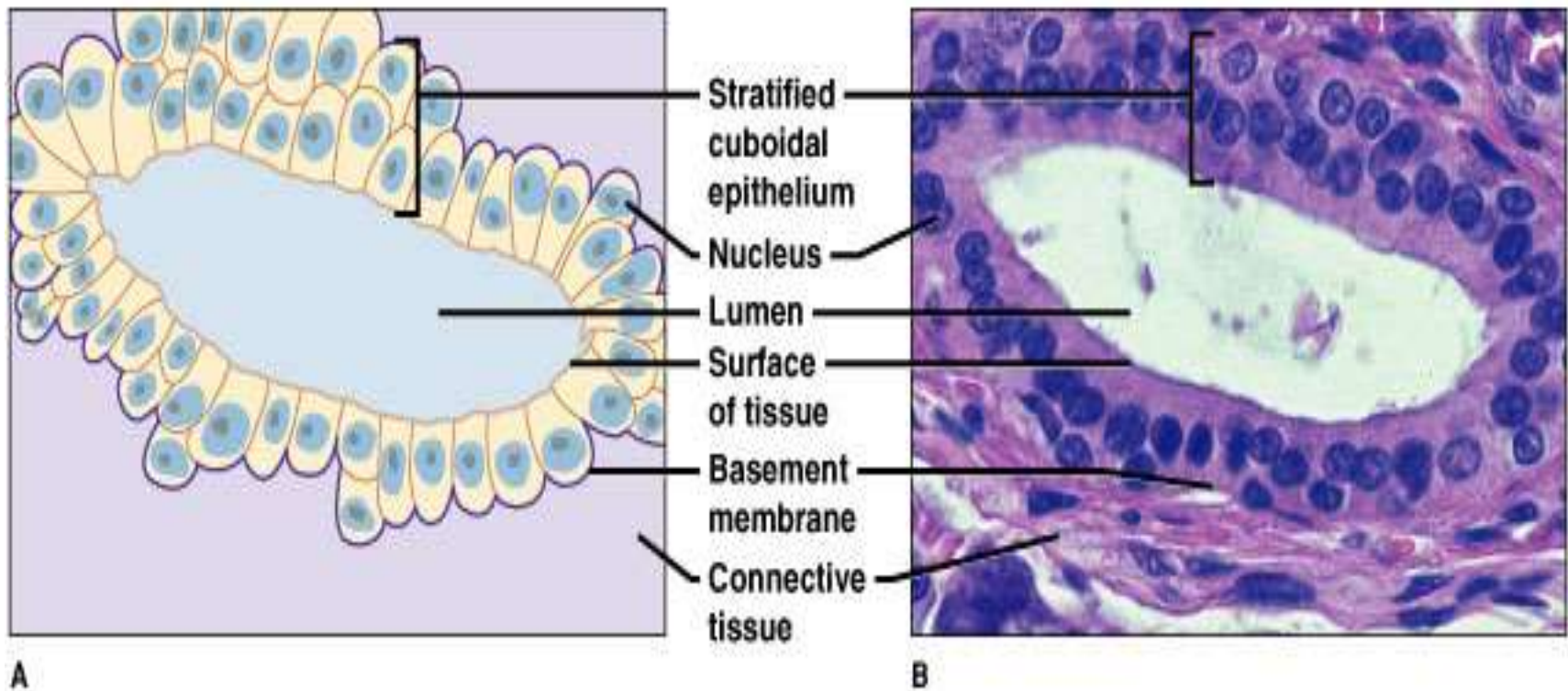
- Surface is covered with layers of compact dead cells without nuclei (keratin)
- **Locations:** Epidermis of skin



→ **Keratin layer**

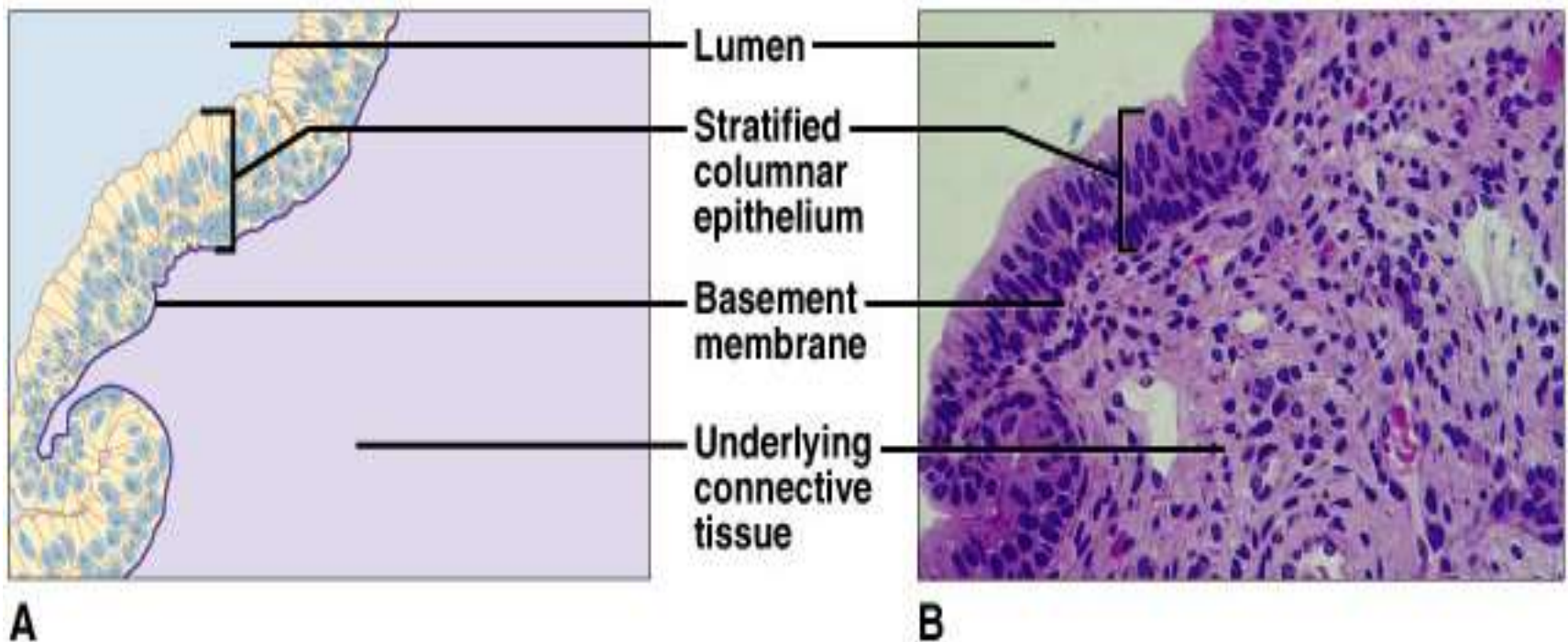
b. Stratified cuboidal epithelium

- **Locations:** Sweat gland, Salivary gland.



c. Stratified columnar epithelial tissue

- **Locations:** palpebral conjunctiva, some part of male urethra.



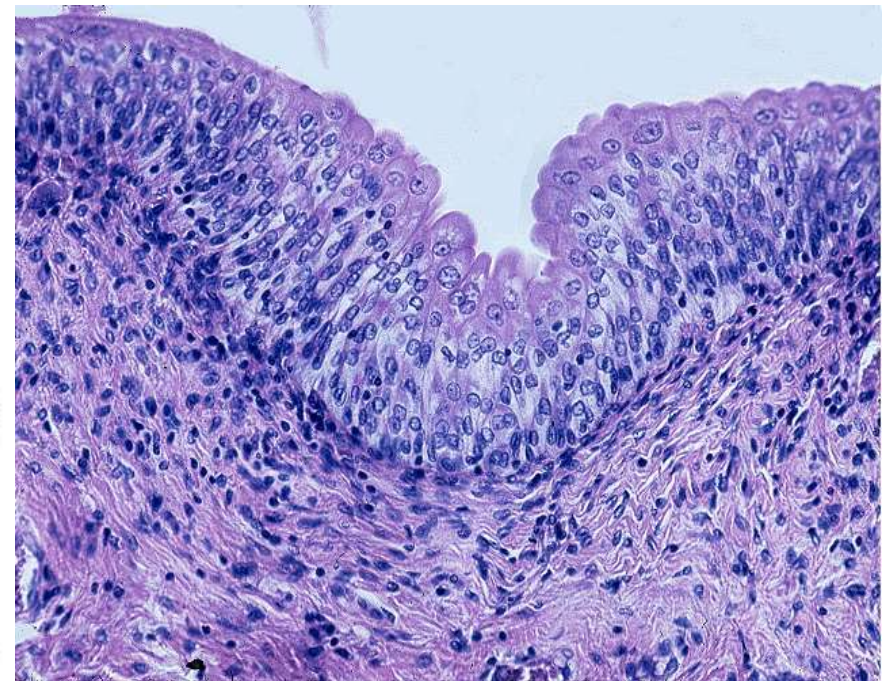
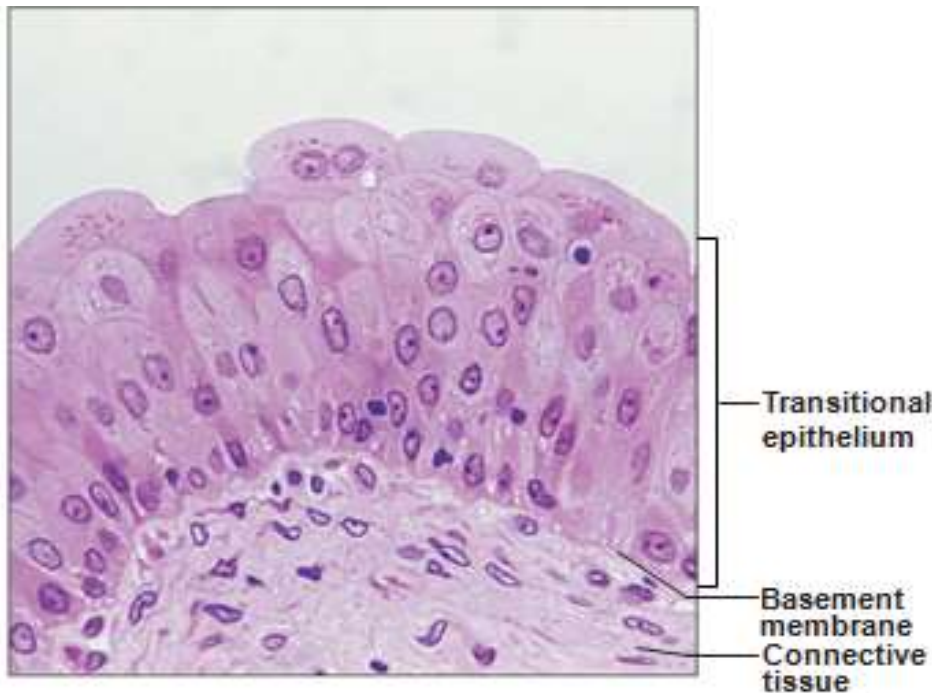
Transitional epithelium

➤ **Description:** Multiple layers of cells.

Surface cells are dome/umbrella shaped.

Middle layers: cells are polyhedral/pear shaped

Basal cells: cuboidal or columnar.



- **Locations:** ureter, urinary bladder
- **Function:** Stretches readily and permits distension of urinary organ by contained urine.

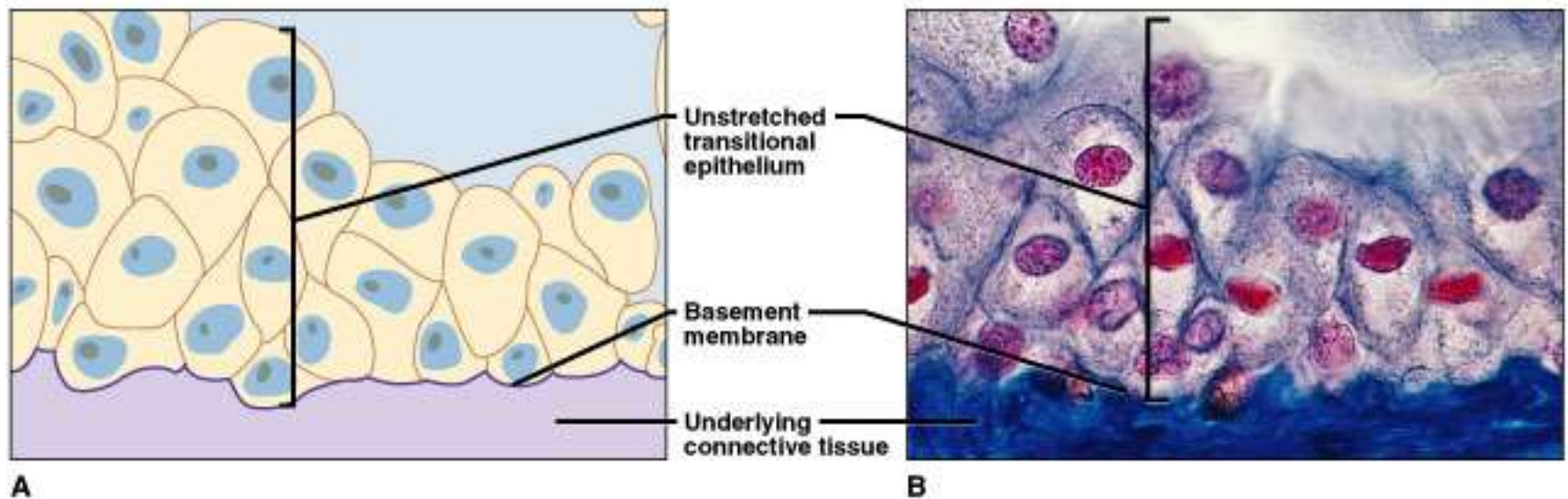


Fig: Empty bladder.

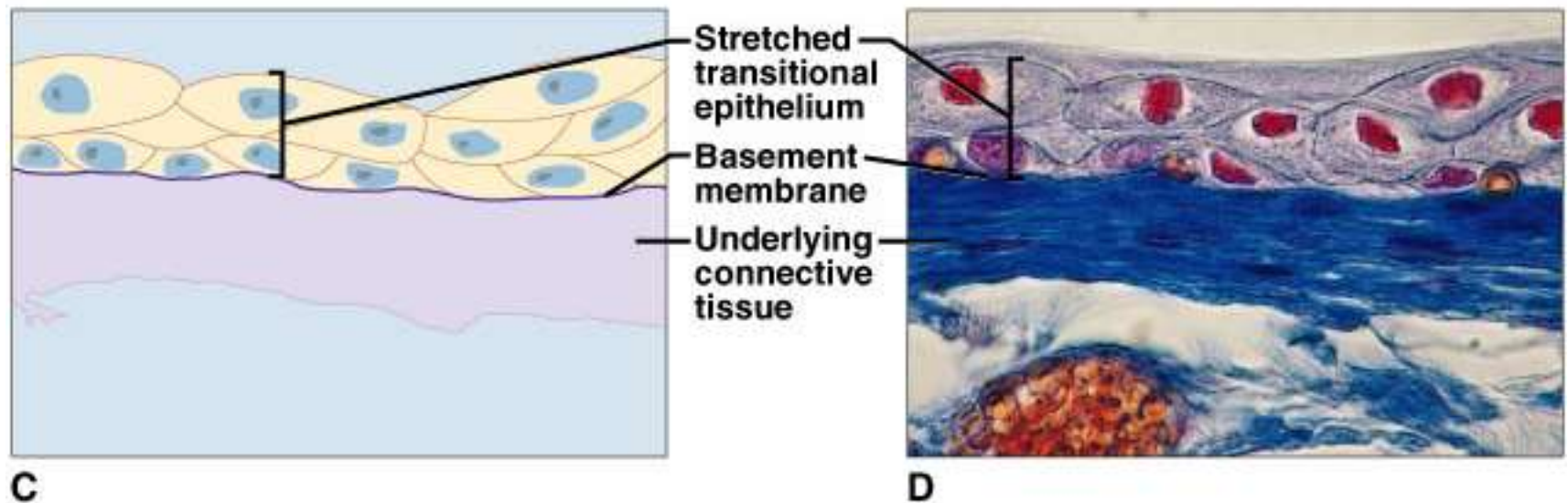
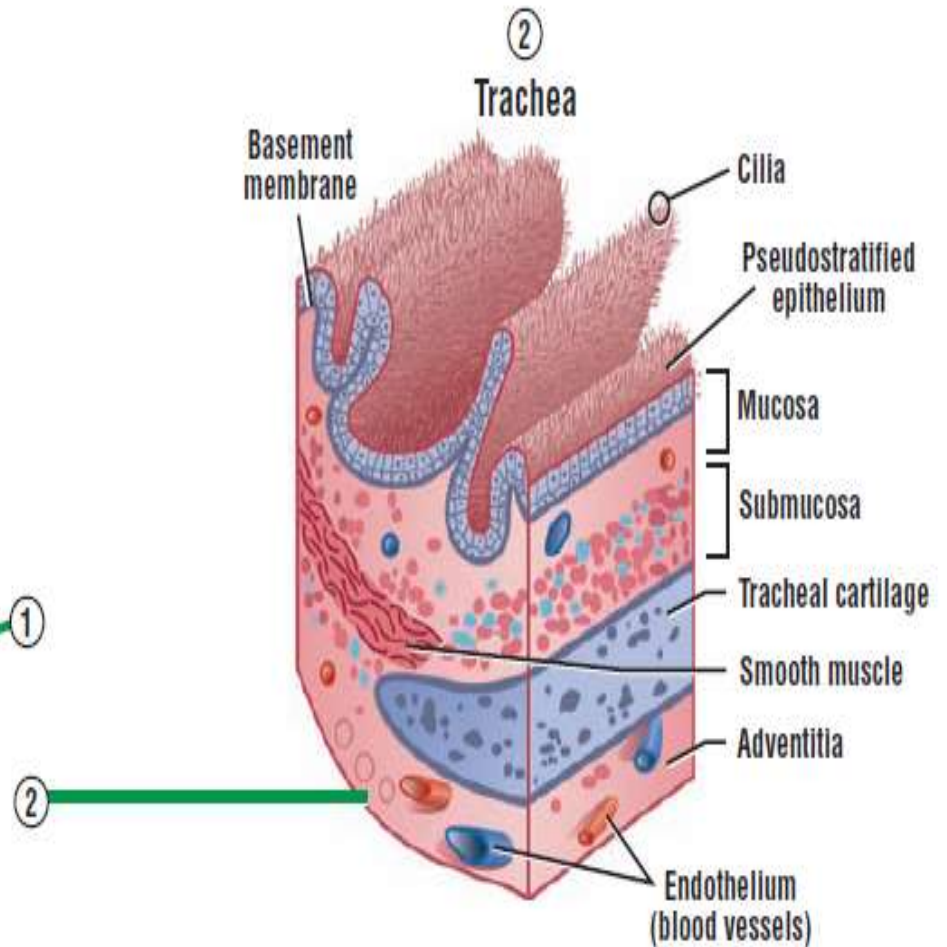
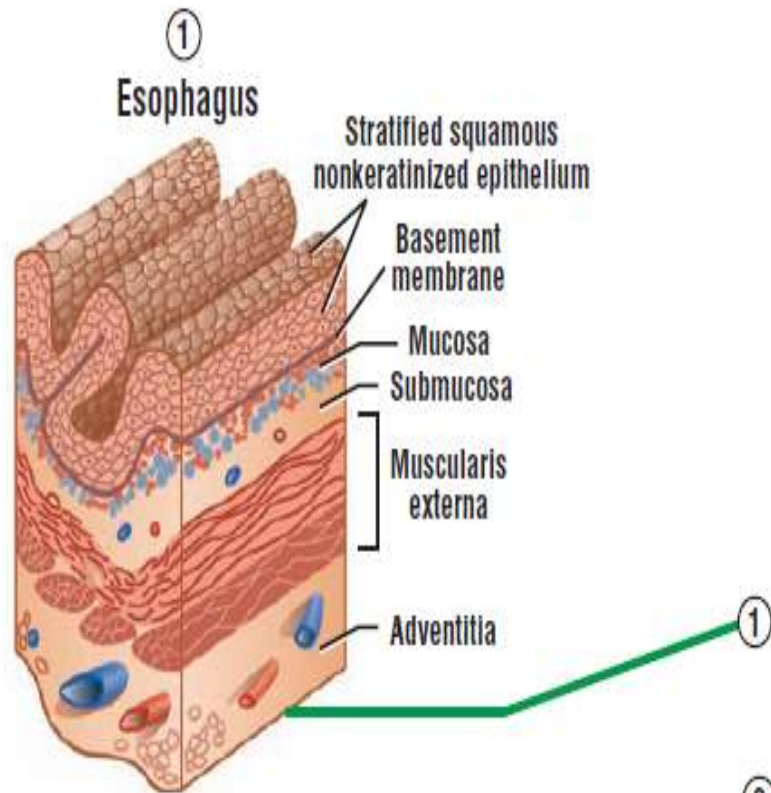


Fig: Distended (full) bladder

Surface modification of epithelial cells

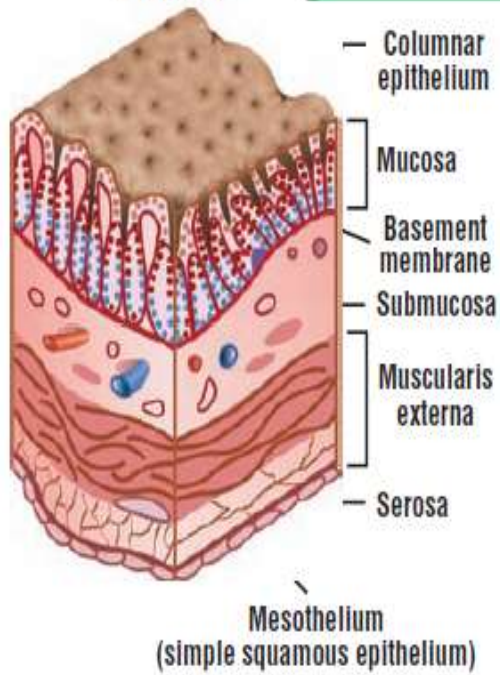
- Microvilli – minute finger like projection of plasma membrane.
 - nonmotile
 - Increase surface area for absorption.
 - Found in stomach,intestine.
- Sterocilia – long finger like projection of plasma membrane
 - nonmotile
 - found in epididymis, vasdeferens.
- Cilia – long hair like projection of plasma membrane.
 - motile
 - found in respiratory tract, uterine tube.

REVISION



③

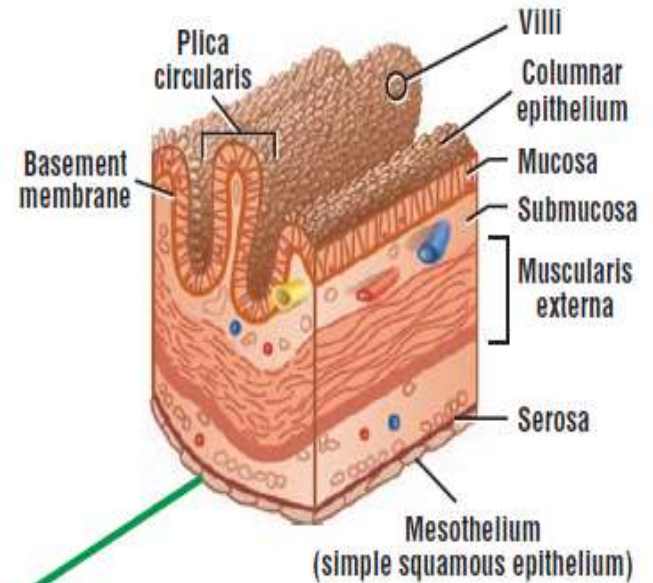
Stomach



③

④

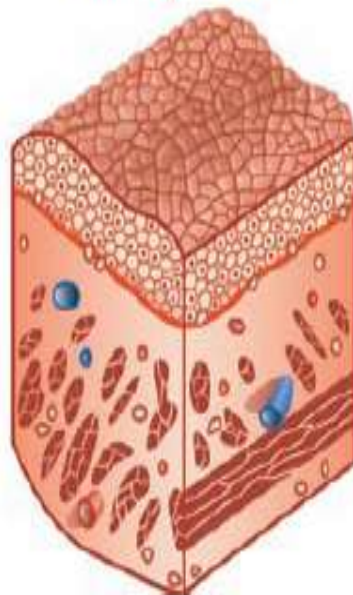
Small intestine



④

⑤

Urinary bladder



Transitional
epithelium

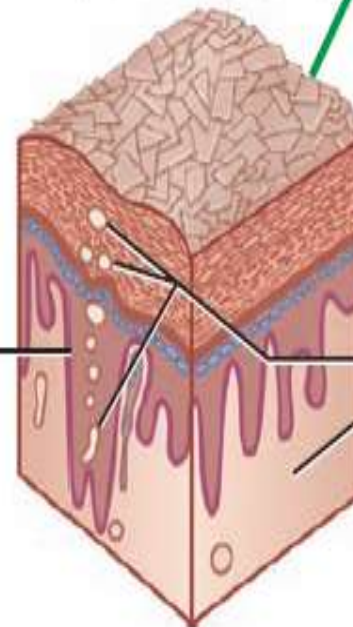
Basement membrane

Smooth muscle bundles
and interstitial
connective tissue

⑤

⑥

Palm (superficial layers)



Stratified squamous
keratinized epithelium

Basement
membrane

Sweat glands

Papillary layer of
the dermis

⑥

THANK YOU

