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Epithelium

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EPITHELIAL TISSUE or EPITHELIUM

- The basic tissue of the body.
- Cells are arranged as continuous sheets.
- Single or multiple layers.
- Cells are held tightly together by cell junctions.
- Free surface
- Basal surface adheres to basal lamina or basement membrane.
- Avascular but supplied by nerves.
- Has high capability to regenerate.

Embryological aspect

- Epithelia are derived from all the 3 germ layers:
- Ectoderm- Epithelium of skin
- Endoderm- Epithelium of gut
- Mesoderm- Epithelium of pericardial, peritoneal and pleural cavities

Functions

- Protection
- Absorption
- Barrier
- Excretion
- Secretory
- Function as sensory surfaces

Classification

According to shape, arrangement and the specialization of their free surface:

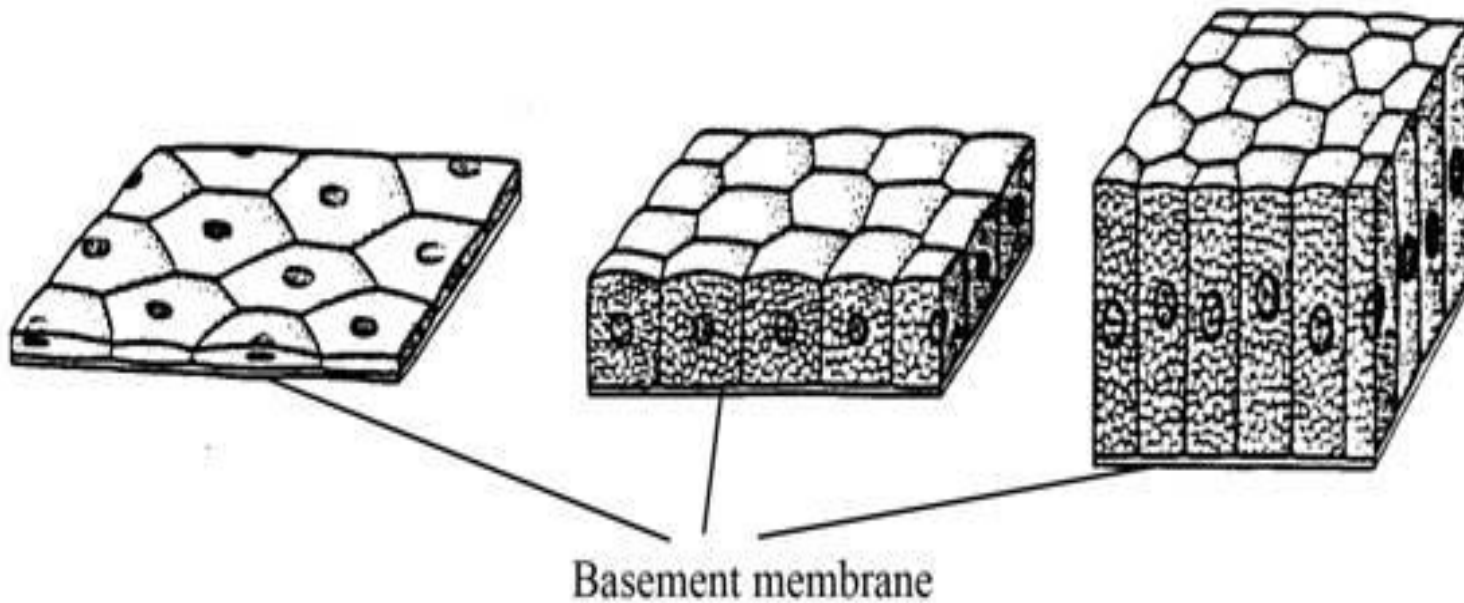
- Simple
- Stratified
- Pseudostratified
- Transitional

Simple epithelium

Simple squamous

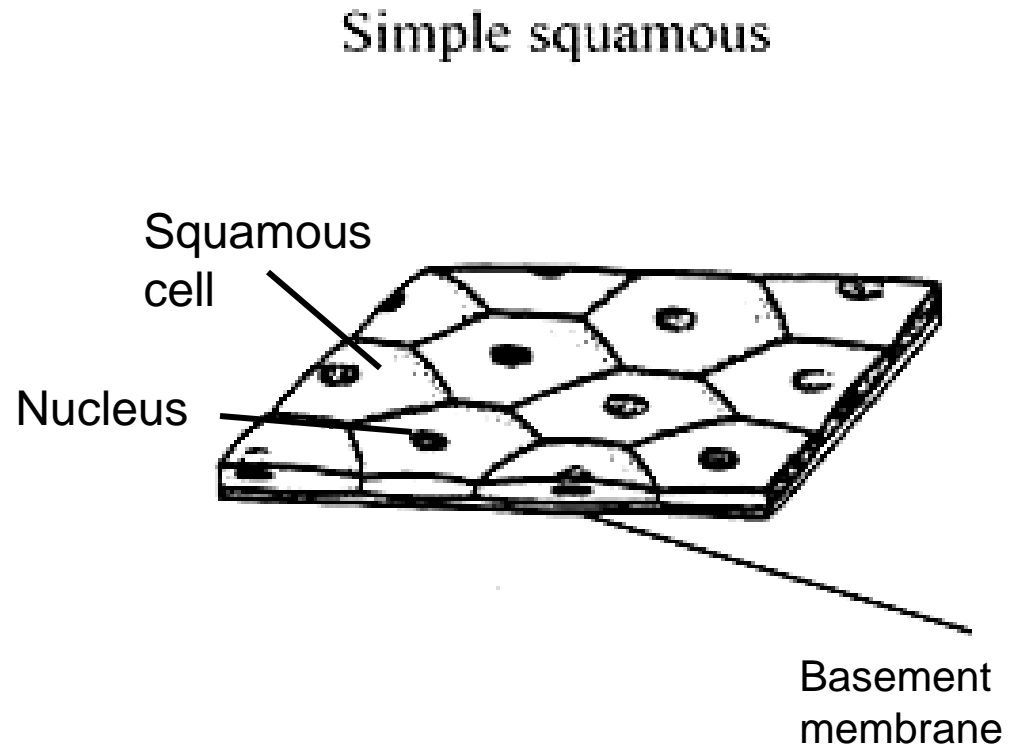
Simple cuboidal

Simple columnar



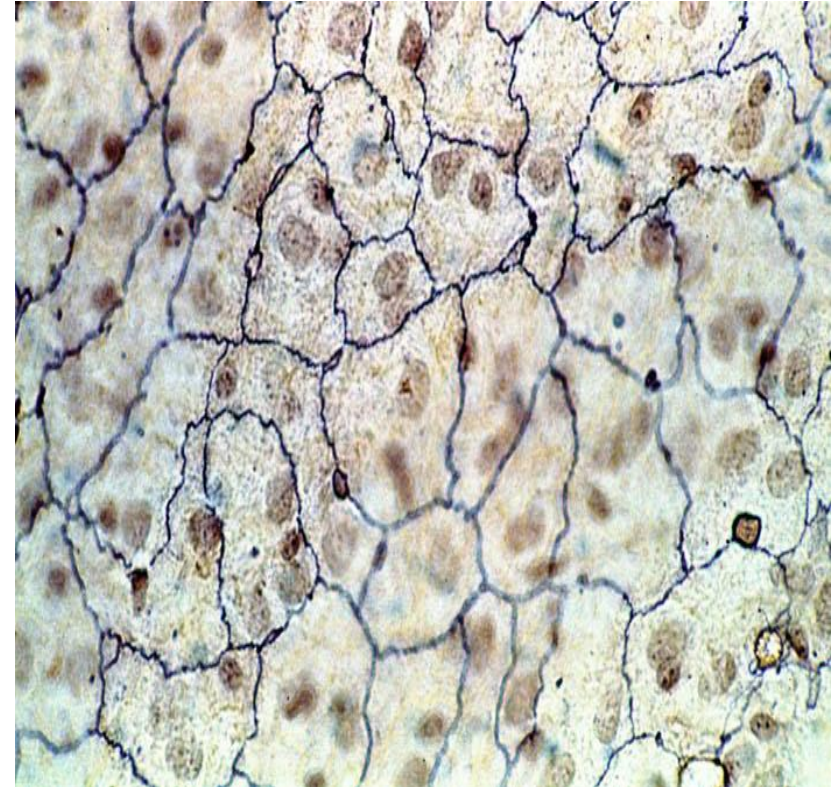
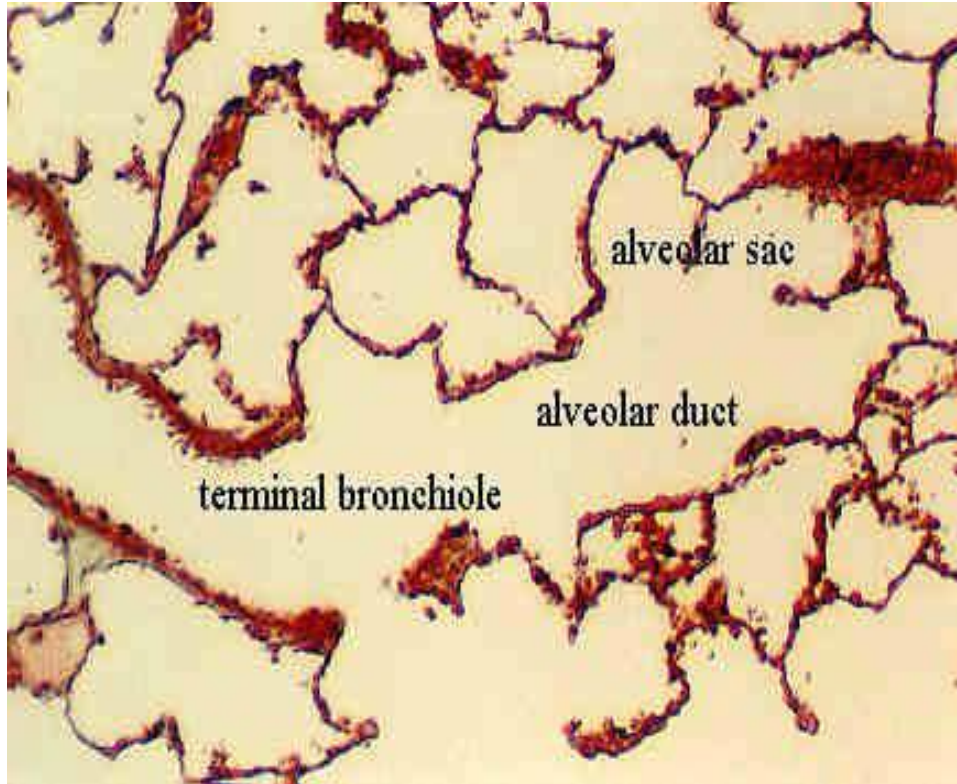
Simple Squamous Epithelium

- Single layered
- Flat cells
- On surface view, like floor tiles
- Elevated nuclei
- Examples:
 - Lung alveoli
 - Parietal layer of Bowman's capsule of kidney
 - Inner aspect of tympanic membrane
 - **Mesothelium**
 - **Endothelium**



Function: Rapid transport of substances, secretion of fluid, diffusion of gases and osmosis

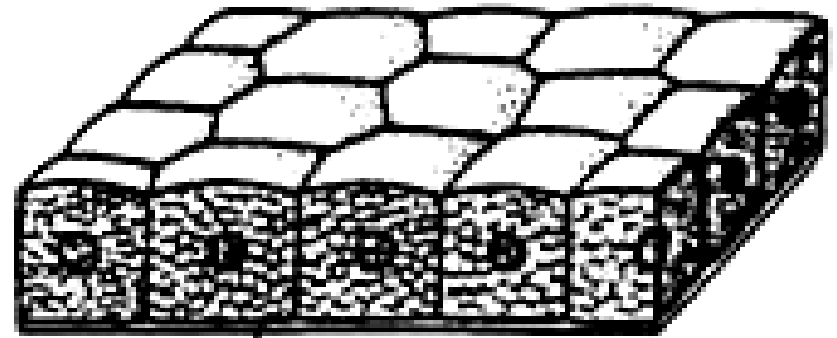
Simple Squamous Epithelium



Simple Cuboidal Epithelium

- Single layer of cuboidal shaped cells
- On surface view, cells look like mosaic (hexagonal)
- Examples:
 - Thyroid follicles
 - Tubules of nephrons
 - Pigmented layer of retina
 - Germinal layer of ovary
 - Inner layer of lens
 - Choroid plexuses of brain

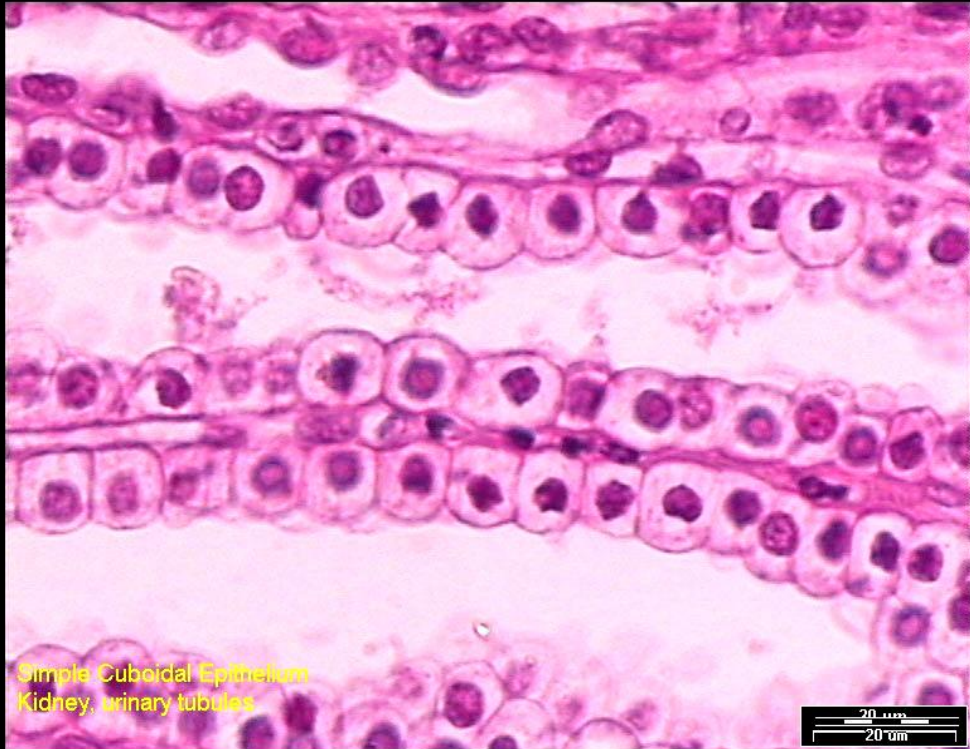
Simple cuboidal



Basement membrane

Function: Secretion and absorption

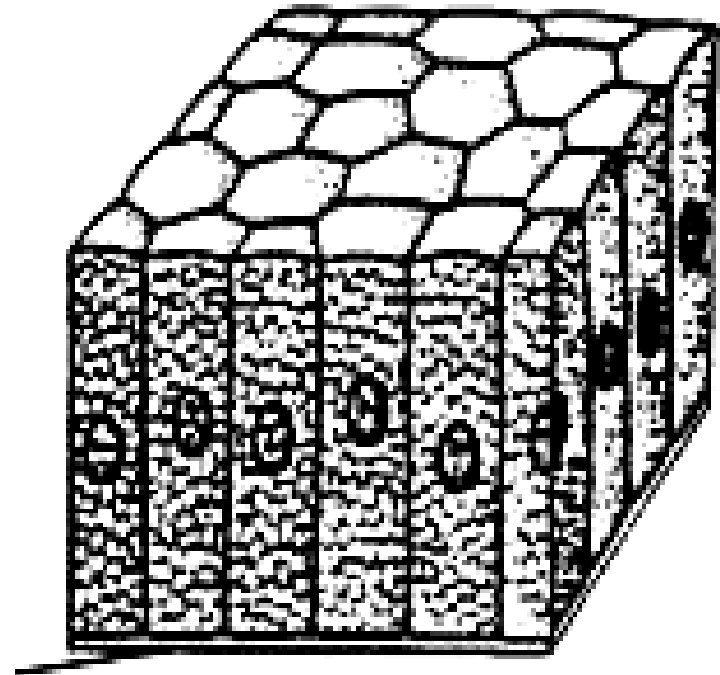
Simple Cuboidal Epithelium



Simple Columnar Epithelium

- Cells having more height than width
- Nuclei are elongated, located in the lower half of cells
- Cells may show some surface modifications
- Examples:
 - GIT(stomach to anus)
 - Gall bladder
 - Uterine tube & cavity
 - Central canal of spinal cord

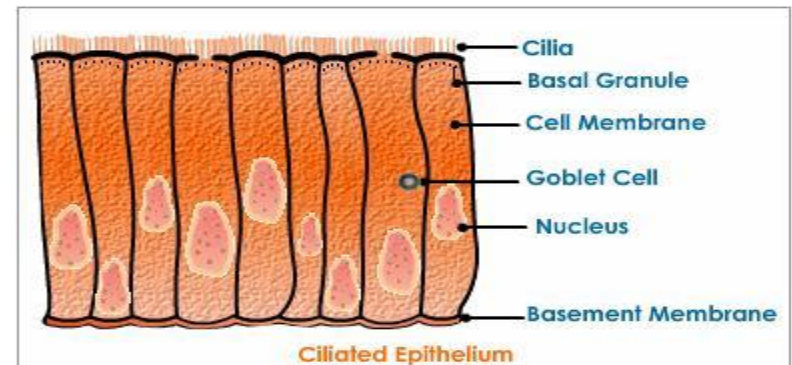
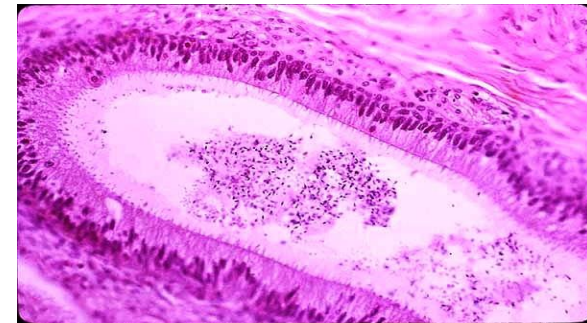
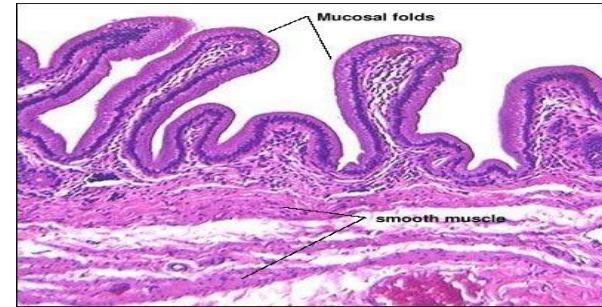
Simple columnar

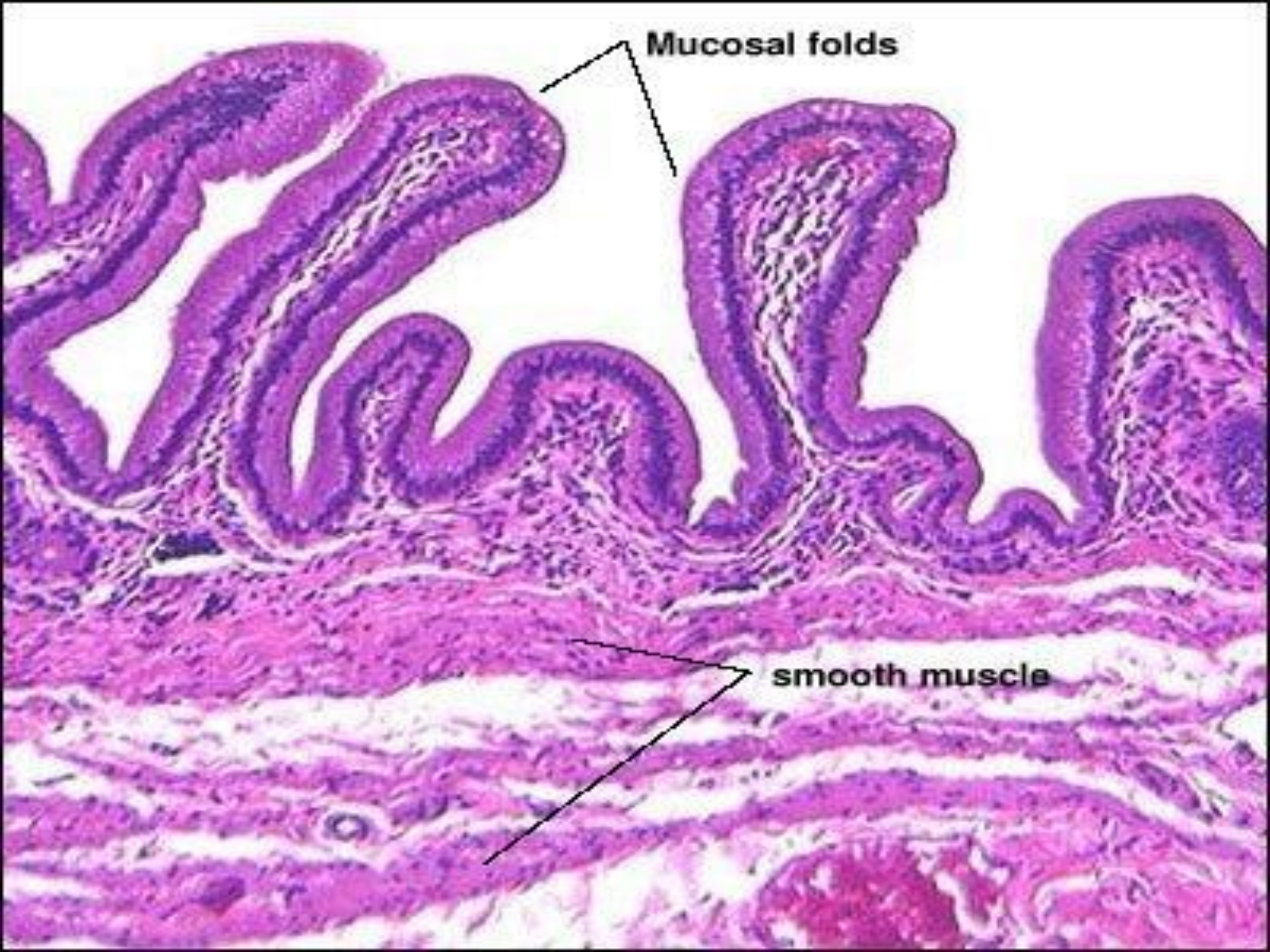


Function: Secretion and absorption;
Ciliary action

Surface modifications

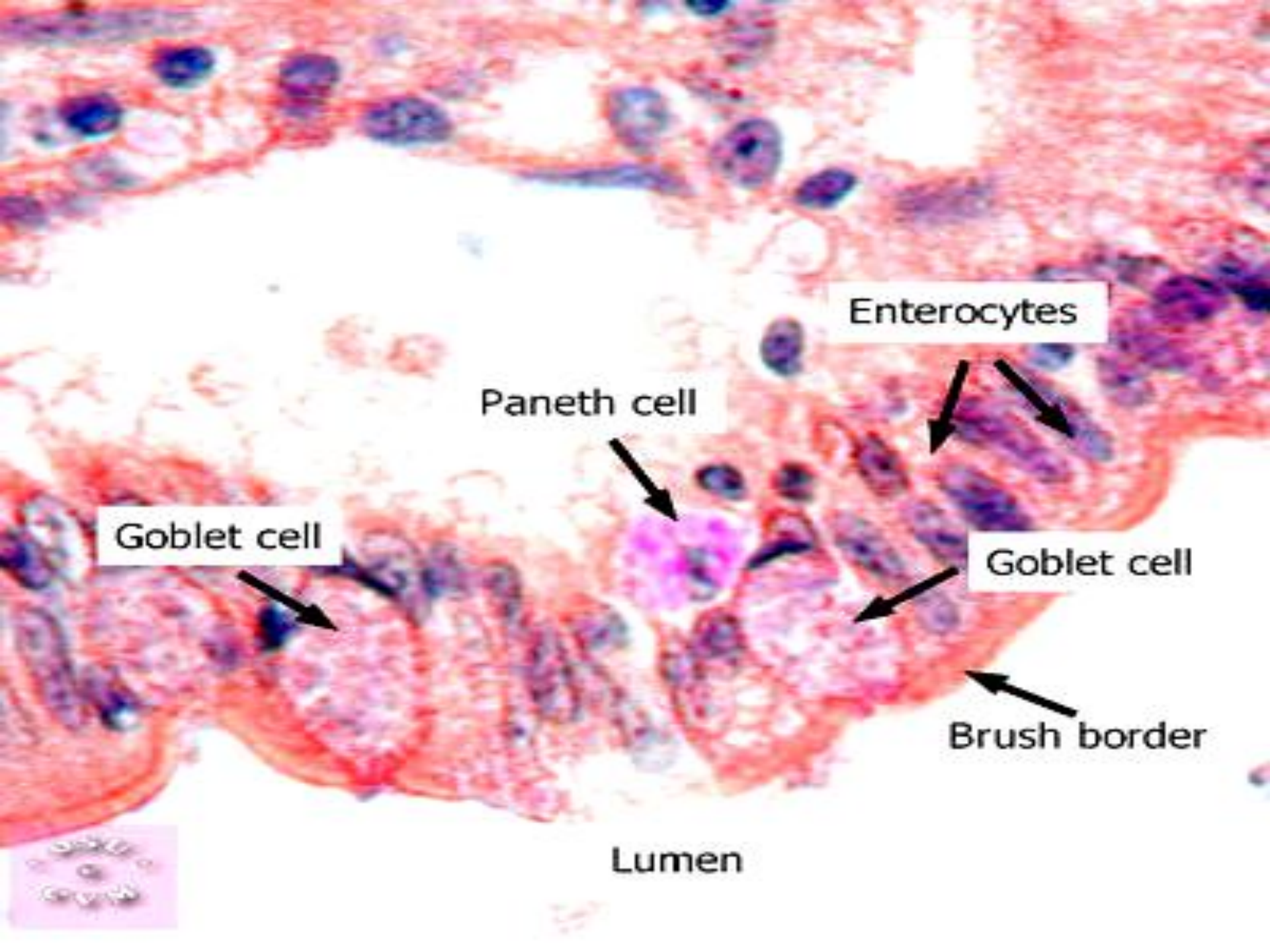
- **Microvilli-**
 - **Striated border** (fine vertical striations)
eg; small intestine
 - **Brush border**—
branched projections
eg; PCT, gall bladder
- **Stereocilia-**
 - epididymus, internal ear (kinocilia), olfactory cilia
- **Cilia –**
uterine tube, efferent ductules of testis, ependyma, middle ear, auditory tube





Mucosal folds

smooth muscle



Enterocytes

Paneth cell

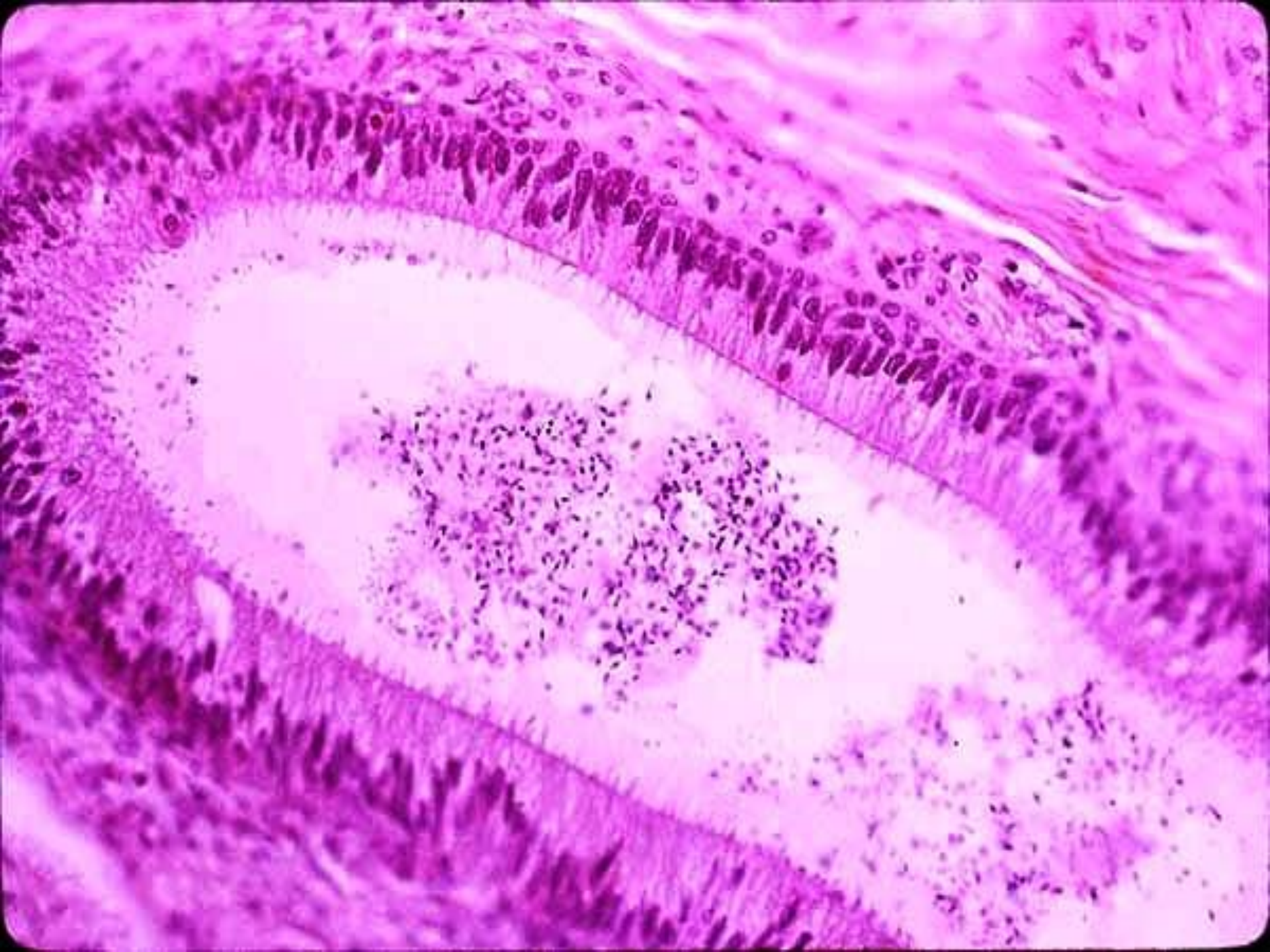
Goblet cell

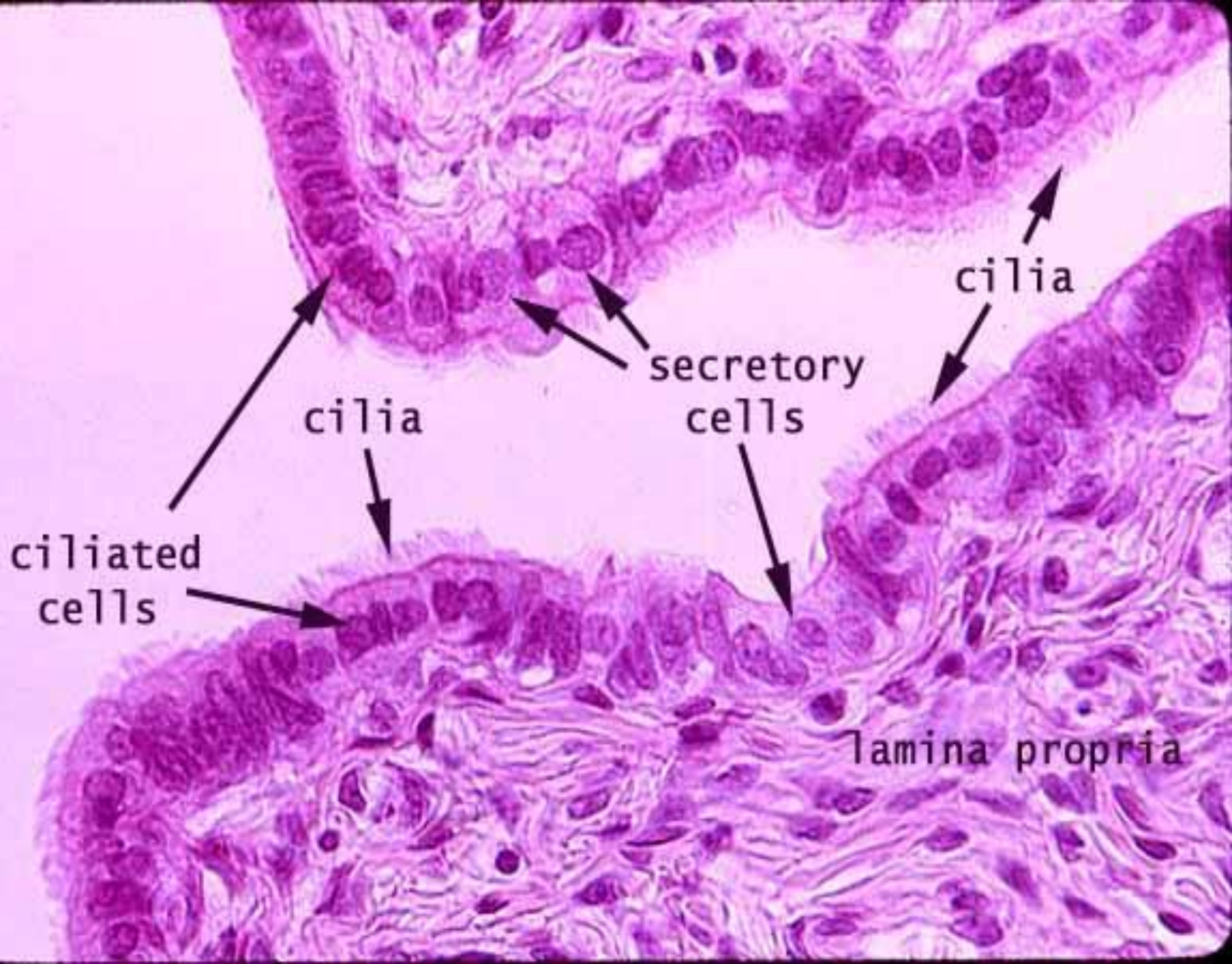
Goblet cell

Brush border

Lumen



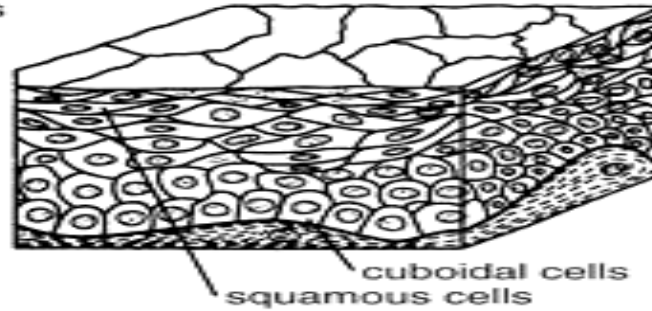




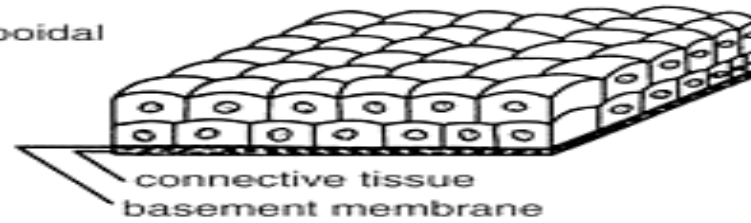
Stratified epithelium

stratified squamous

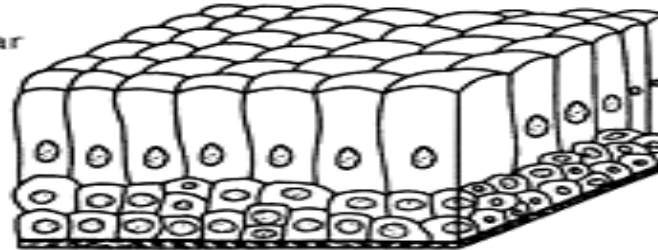
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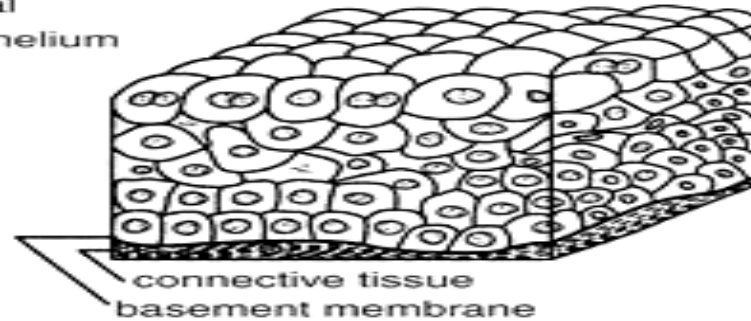
stratified cuboidal



stratified columnar



transitional
epithelium



Stratified Squamous Epithelium

- Multi layered squamous cells

- **Keratinized:**

 - Skin

 - Tongue

- **Non keratinized:**

 - oral cavity

 - esophagus

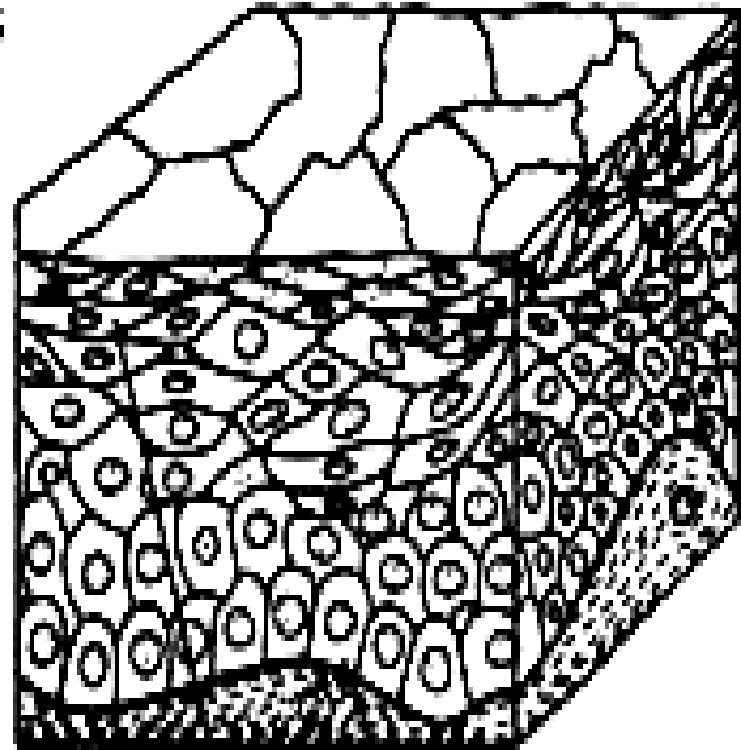
 - vagina

 - cornea

 - anal canal

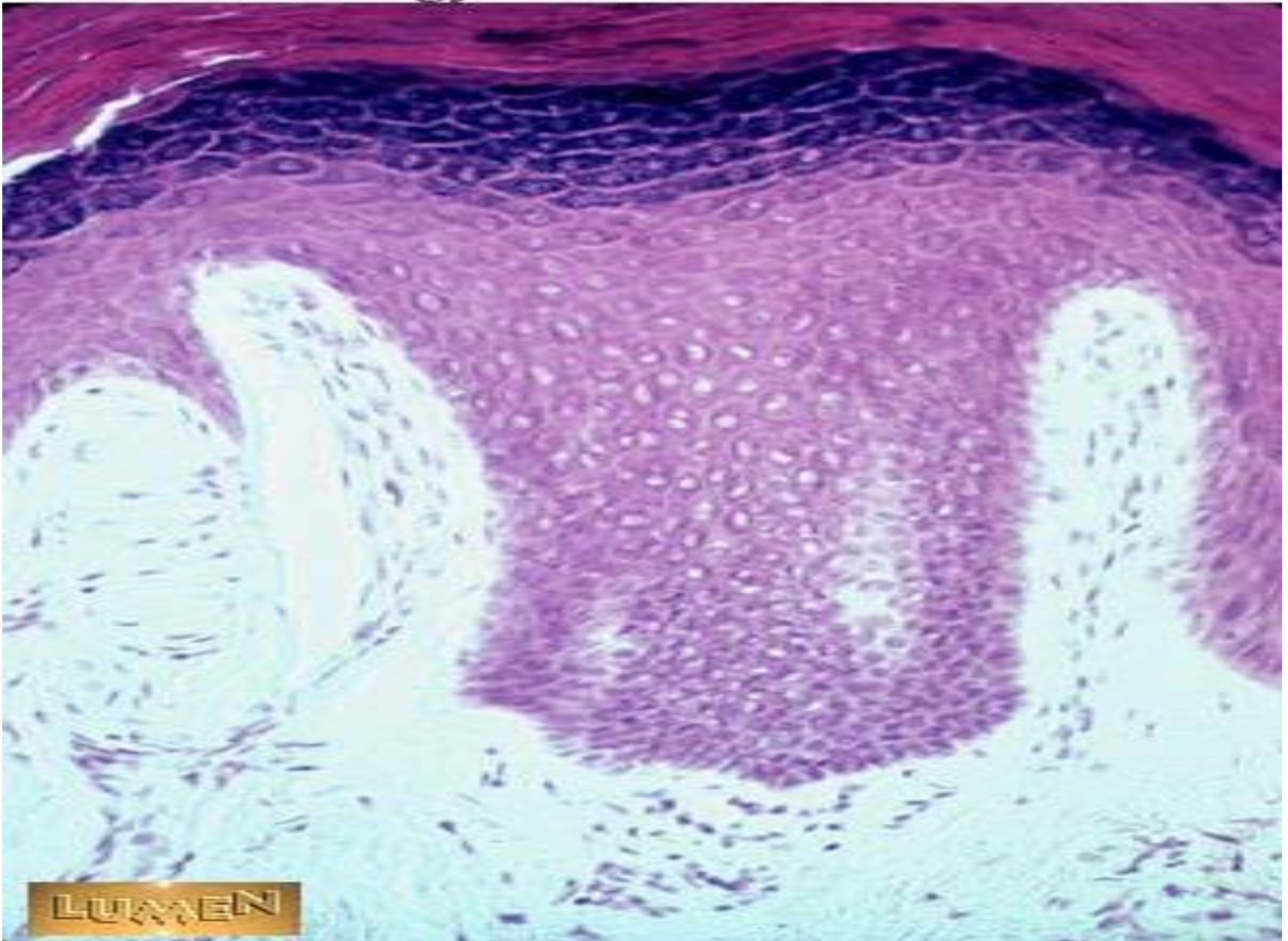
Function: Protection of deeper tissue

US



cuboidal cells
squamous cells

Stratified squamous (keratinized)



Stratified squamous (non keratinized)



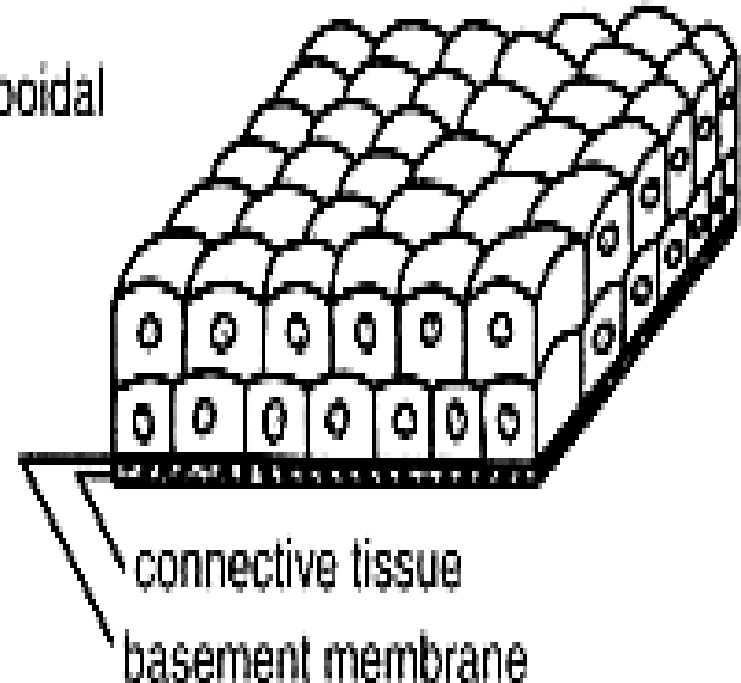
Stratified Cuboidal Epithelium

Cells: two layers

Nuclei: centrally located,
and spherical

Functions: absorption,
secretion

stratified cuboidal



Examples—

Ducts of sweat glands, ovarian follicle, seminiferous tubules

Functions: Passage to the secretion and acts as barrier

Ovary H&E

antrum

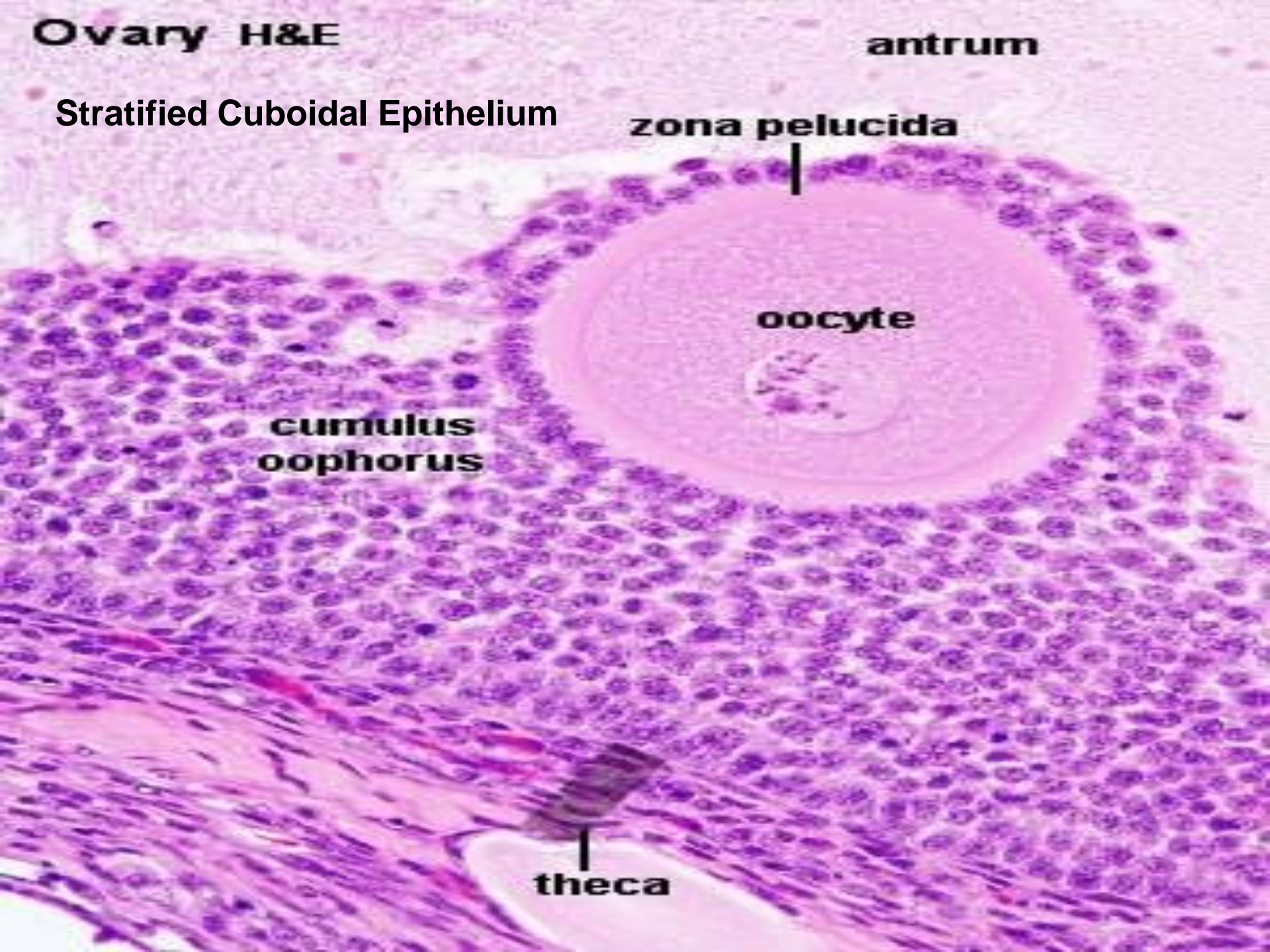
Stratified Cuboidal Epithelium

zona pelucida

oocyte

cumulus
oophorus

theca

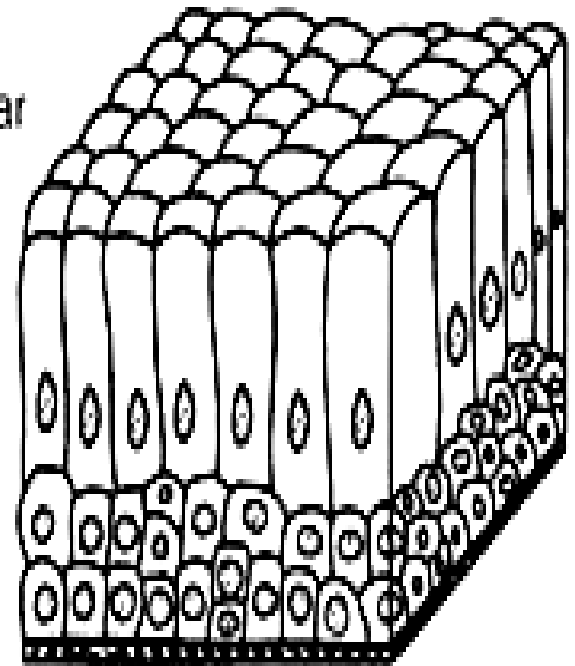


Stratified columnar

- Two or more layer of cells
- Superficial cells are columnar
- Examples – Conjunctiva
Cavernous urethra

Functions: Passage to the secretion and acts as barrier

stratified columnar

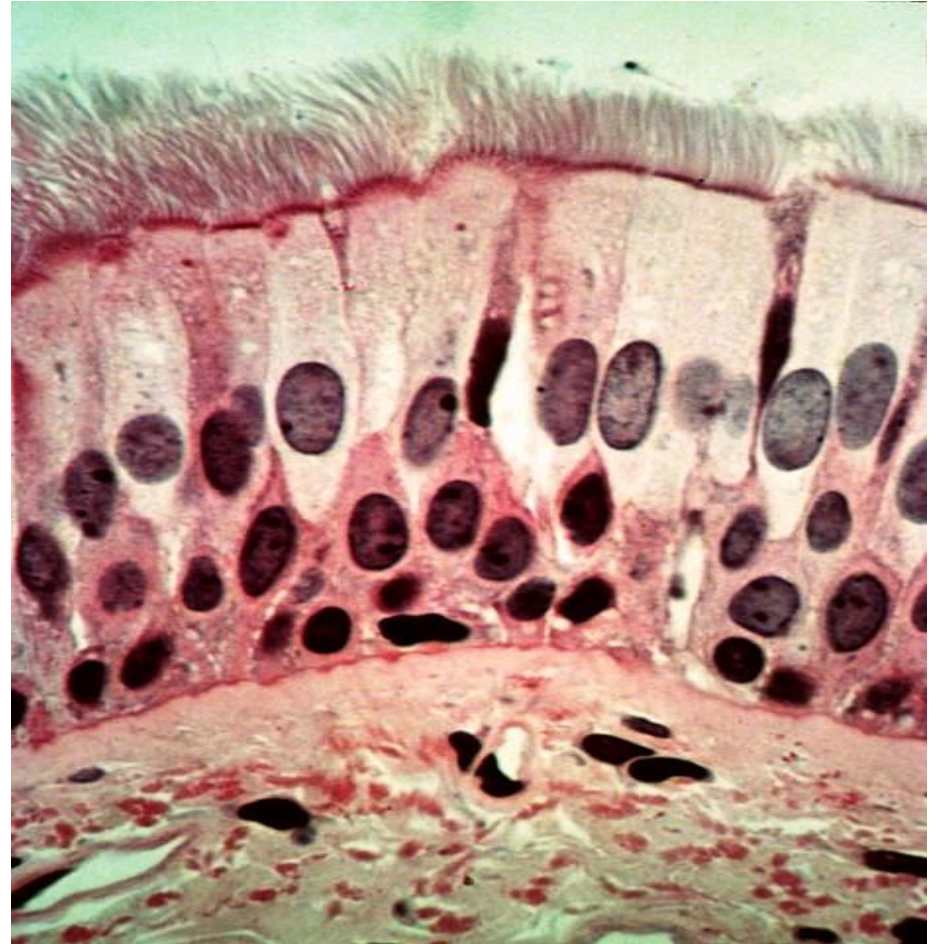


Pseudostratified Columnar epithelium

- Cell of unequal heights resting on same basement membrane.
- Ciliated/non-ciliated
- May contain goblet cells
- Examples-
Trachea, bronchi, auditory tube, ductus deferens, male urethra

Functions:

Protection, ciliary movements remove mucus, goblet cells secrete mucus

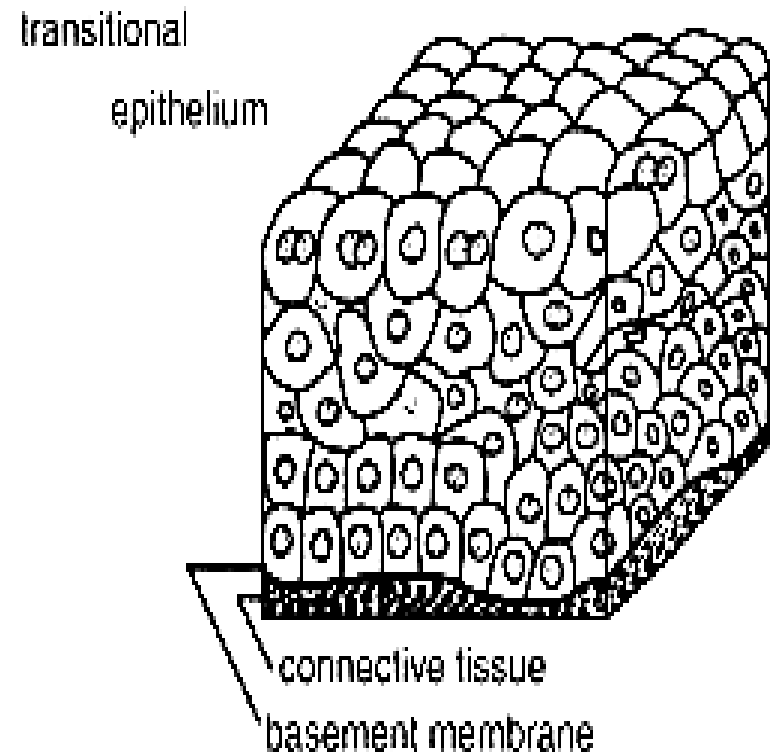


Transitional epithelium (urothelium)

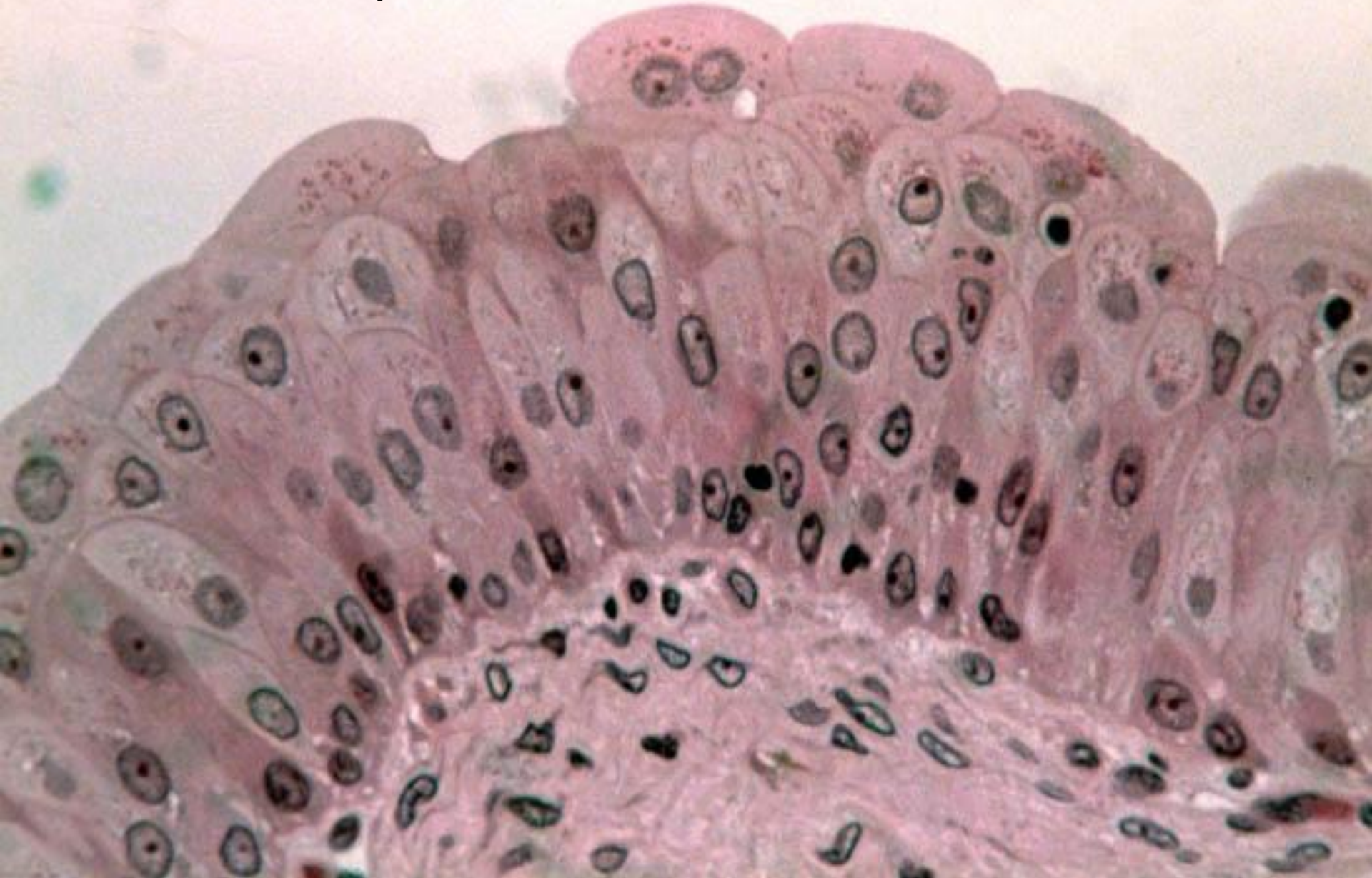
Layers-

- Basal layer**- columnar or cuboidal
- Middle layer**- pear or polyhedral cells (interdigitating layer)
- Outer layer**- rounded or umbrella cells, often binucleate
- Eg; ureter, urinary bladder

Functions: Protection,
distention



Transitional Epithelium



References

1. diFiore's Atlas of Histology with functional Correlations, 12th Edition.
2. Essentials of Anatomy for Dentistry Students, 1st Edition.
3. Textbook of Histology, 3rd Edition.

MCQ

- Simple Squamous epithelium is seen in-
 1. Alveoli of lungs
 2. Stomach
 3. Urinary bladder
 4. Tongue

MCQ

- Transitional epithelium is found in-
 1. Uterus
 2. Ureter
 3. Gall bladder
 4. Vagina

MCQ

- Stomach is lined by-
 1. Simple columnar epithelium
 2. Straified squamous epithelium
 3. Simple cuboidal epithelium
 4. Pseudostratified columnar epithelium

MCQ

- Pseudostratified Columnar ciliated epithelium is a feature of-
 1. Ureter
 2. Skin
 3. Trachea
 4. Kidney

MCQ

- All are the functions of epithelium **except** -
 1. Protection
 2. Absorption
 3. Secretion
 4. Assimilation