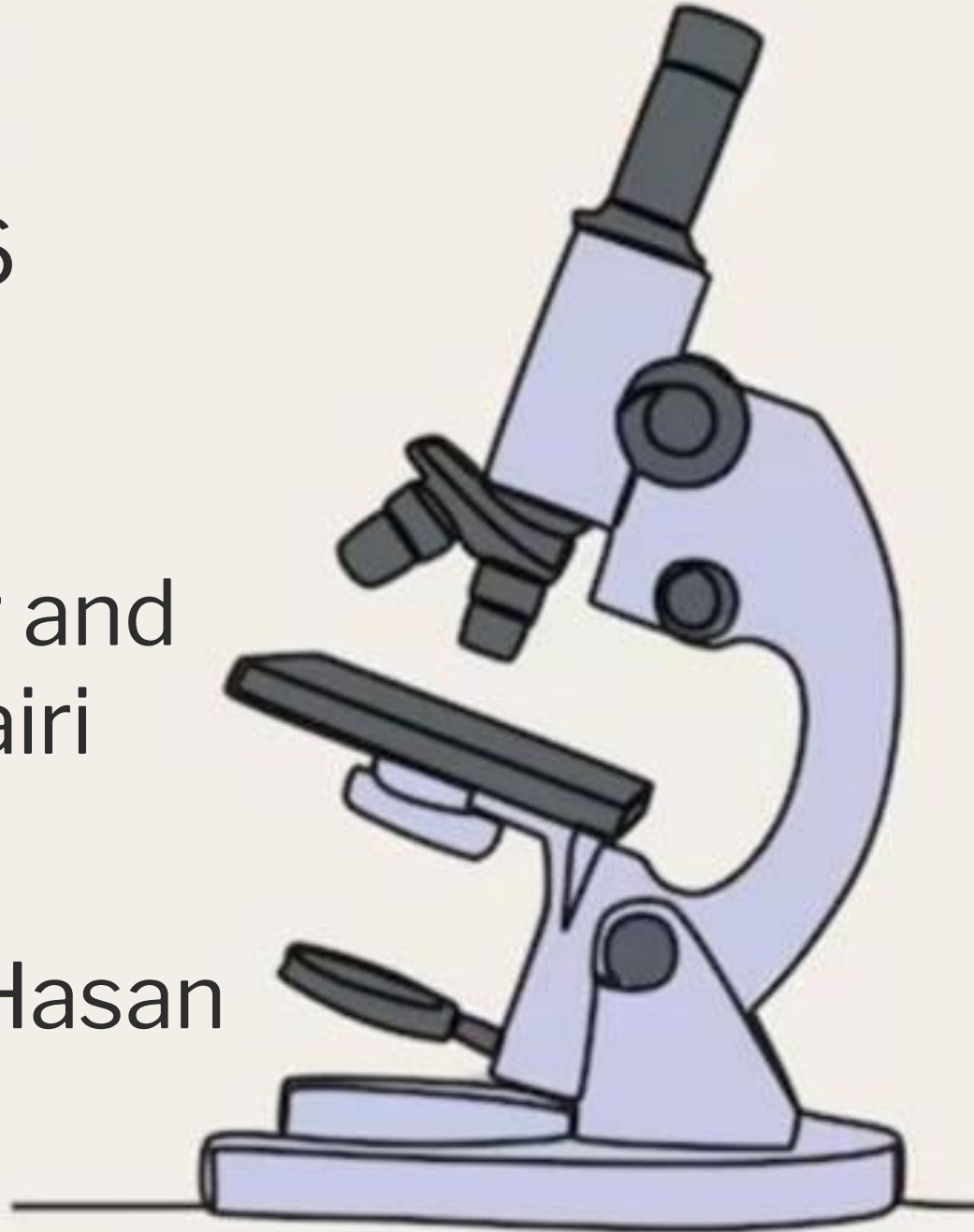


Histology

Modified n. Histology n.6

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Stratified Epithelium → more than one layer

- Classified based on the shape of the most superficial layer.
- Stratified squamous epithelium: Keratinized and non-keratinized
(can be seen in many locations) → related to the most superficial layers
- Stratified cuboidal epithelium
- Stratified columnar epithelium
(Seen in The conjunctiva of the eye)
- Transitional epithelium

Classified based on shape and number of layers

Rare to see

Based on thickness for protection

Simple(squamous → cuboidal → columnal) → pseudostratified → stratified(squamous → cuboidal → columnar)

Stratified squamous non-keratinized

- Apical layers are squamous but the basal is polyhedral.

- Protection

- Location:

- Oral cavity

- Pharynx

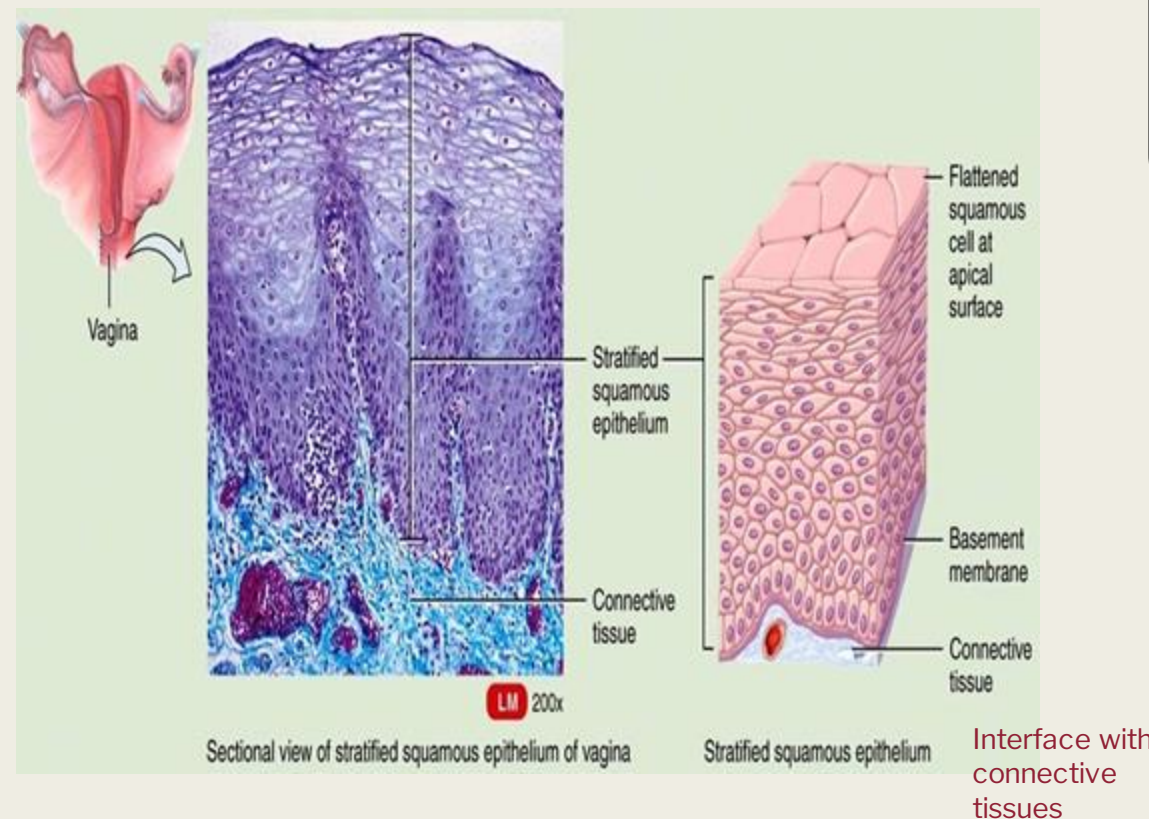
- Esophagus

- Anal canal

- Uterine cervix

- Vagina

- Cornea

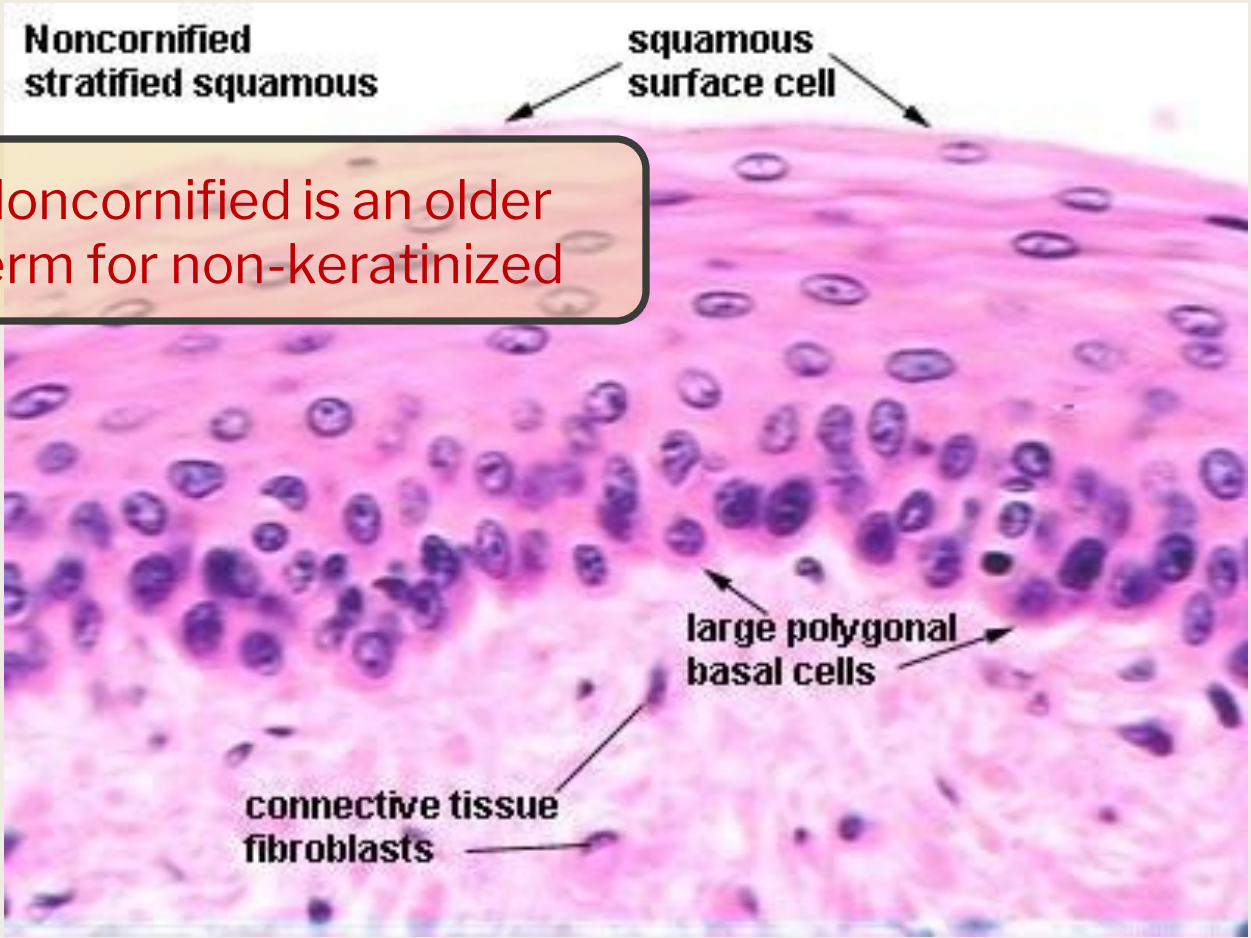


Epithelium can be seen in locations facing a lot of stress as it needs strong tissues that can protect it. The stratified squamous can serve both protection and specified function.

There is a difference between epithelium in the oral cavity and the cornea as the oral cavity needs more protection.

the Cornea (القرنية) needs tissues that is transparent and allow the passage of light → so it needs a specific number of layers to serve both protection and function.

Stratified squamous non-keratinized



A characteristic of stratified squamous is having a lot of layers

Noncornified is an older term for non-keratinized

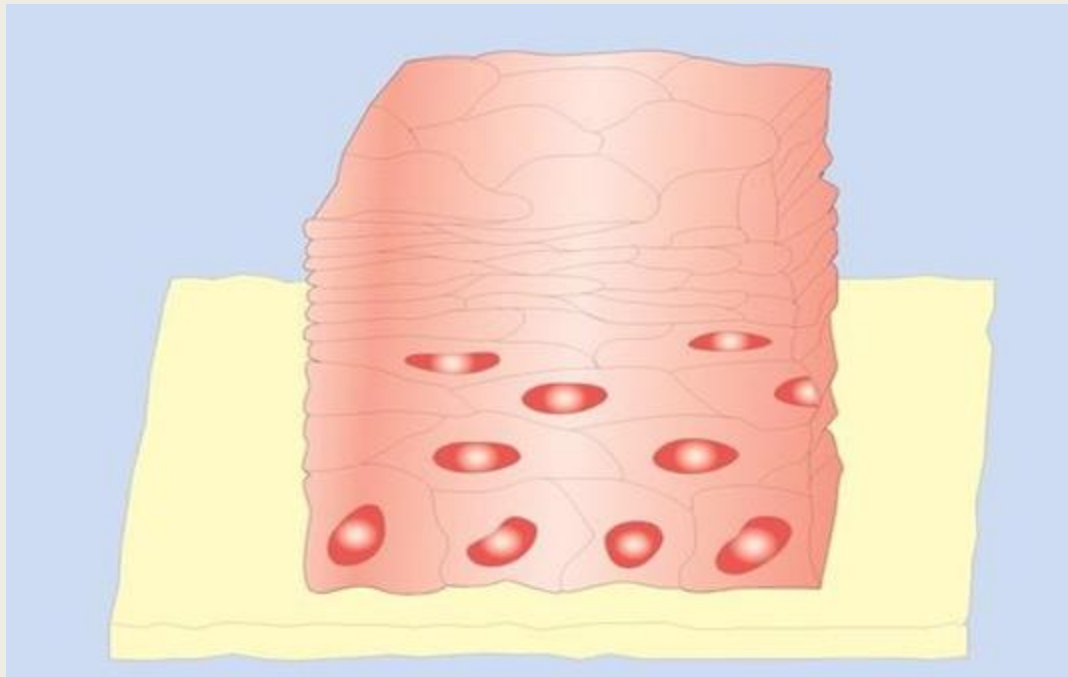
Apical cells → more squamous looking

Basal cell → Rounded polyhedral cells

Light microscope → bright field → H&E stain

Stratified squamous keratinized epithelium (dry) → dead cells in the most superficial layer (epidermis)

- The superficial layers are cells filled with keratin filaments
- **Location:** Epidermis of skin.



The Dermis layer → below the epidermis → consists of both loose and dense connective tissues and is supported by hypodermis (superficial fascia)

This type of tissues provide a layer of protection and lock in the moisture inside

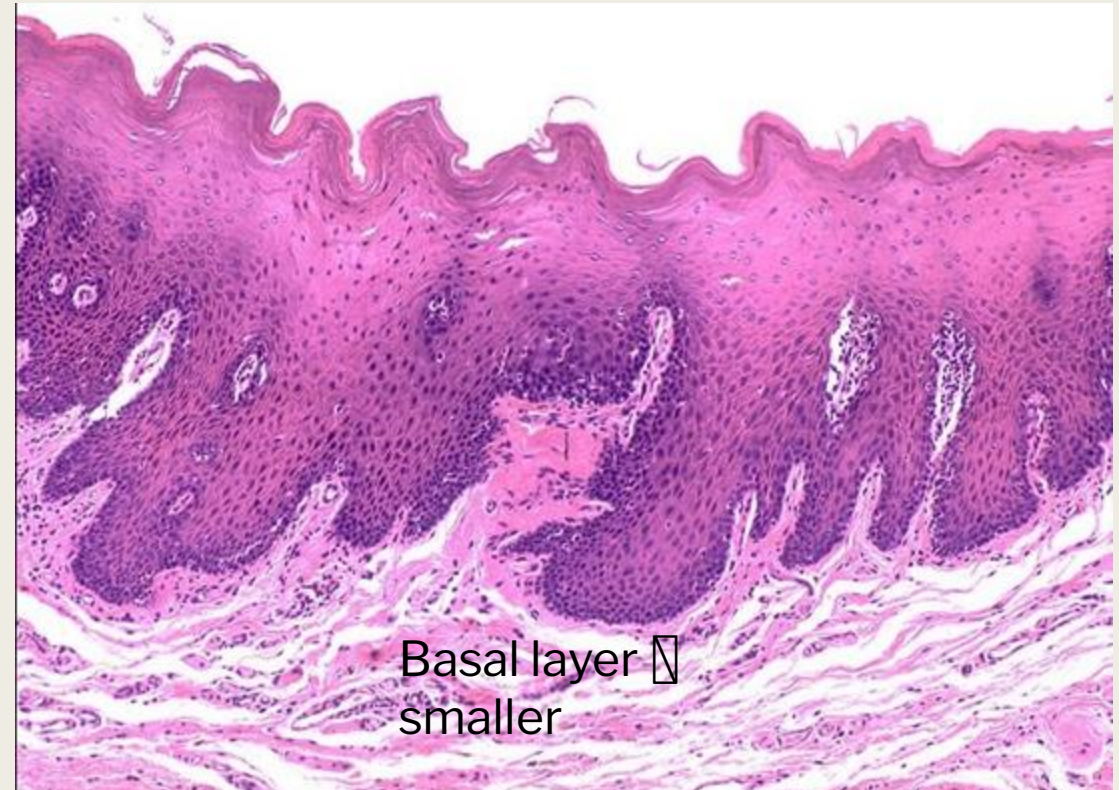
We can distinguish this type by the last layers as it consists of dead cells filled with keratin (doesn't have any organelles nor nuclei to save space for keratin)

Stratified squamous keratinized epithelium (dry) → dead cells in the most superficial layer (epidermis)

- The superficial layers are cells filled with keratin filaments
- **Location:** Epidermis of skin.

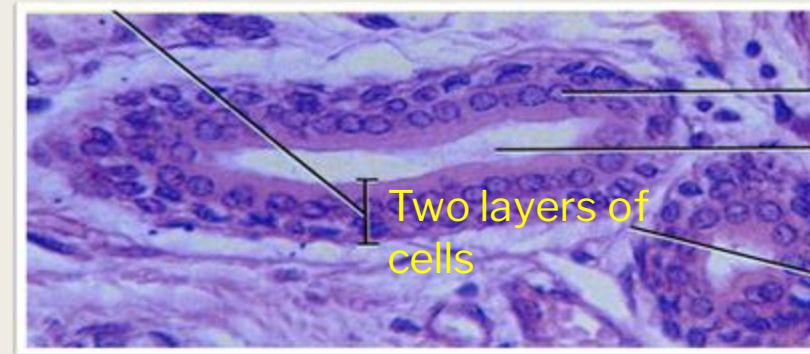
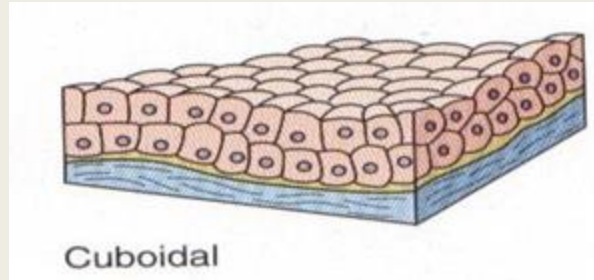
Basal cells → Smaller → nuclei are closer together → basophilic (stained purplish blue by hematoxylin)

Apical cells → larger → and more cytoplasm → eosinophilic or acidophilic (stained pink by eosin)



Stratified cuboidal epithelium

The basal surface of the apical cells rest on the apical surface of the basal cells



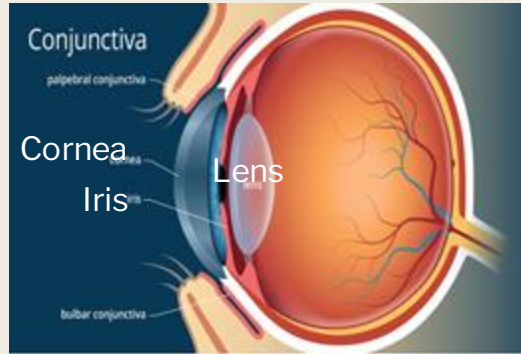
Apical layer → in contact with the lumen
lumen
Connective tissues

- Rare type. → not seen much and usually associated with larger glands
- Superficial layer is cuboidal.
- Location: larger ducts of exocrine glands such as salivary glands

The stratified columnar is another rare type which we can actually see in certain ducts

This is a haematoxylin and eosin section which was acquired using a brightfield light microscope

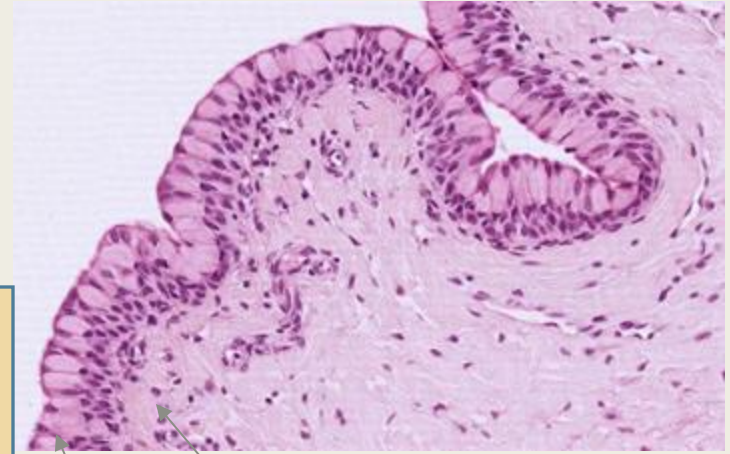
Stratified columnar epithelium



Goblet cells participate in the mucus part of our tear fall which is not just water fluids but is composed of lipid, mucus, and water

The cornea is covered with nonkeratinized stratified squamous and it is relatively thin

The whitish part of our eyes is the sclera and is covered by the conjunctiva which also lines the inner aspect of the eyelids



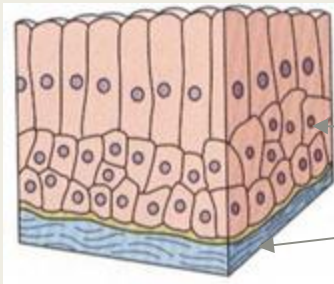
The epical surface of the most superficial layer

The basal layers/cells

Rare type.

Protection.

Location: Conjunctiva with Goblet cells



Cuboidal/polyhedral cells

Basement membrane

The most famous example of the stratified columnar is in the conjunctiva

The conjunctiva contains goblet cells which provide the mucus that participates in covering and protecting the outer surface of the cornea and the sclera

An atypical type of stratified which transitions from one form to another located in parts of the covering/lining of the urinary tract and allows distention meaning if an organ is stretched so is the epithelium

Transitional epithelium

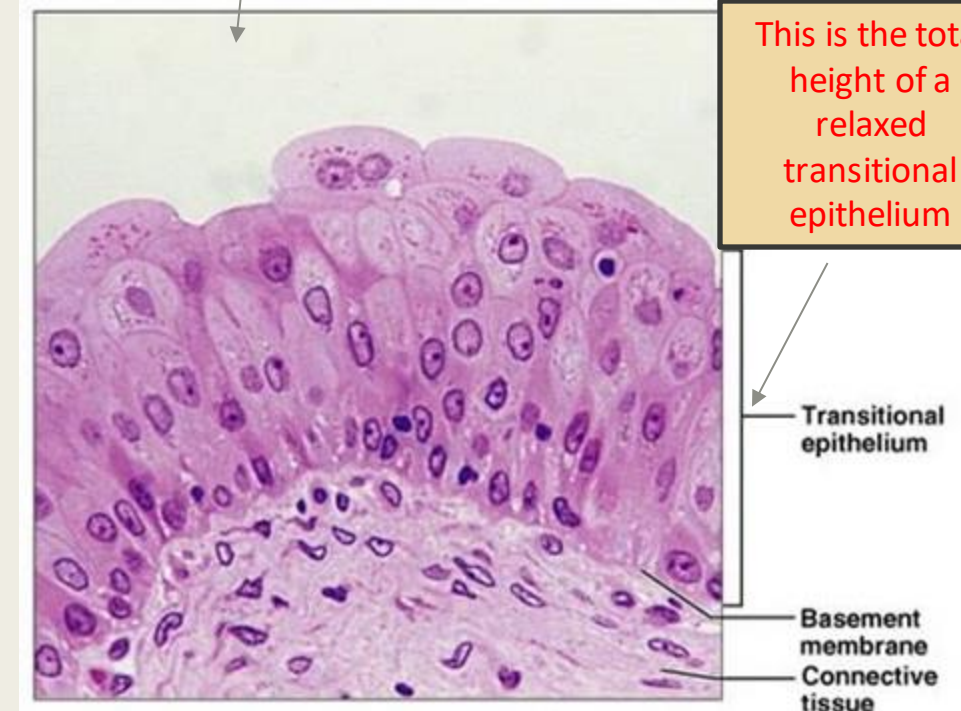
- Appears cuboidal when relaxed and squamous when stretched.
- Also called urothelium.
- Location: most of the urinary tract.
- Function: allows stretching, protection.

Assuming we have 5x height of the epithelium when stretched we end with 2.5-1x depending on how much urine the bladder contains

e.g. the urinary bladder: before it's filled with urine it was empty so this is how the epithelium would look like

If stretched it's gonna lose parts of its height to allow the increase of the total length of the organ

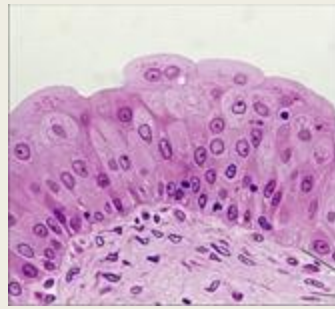
The more urine the bladder contains the more it has to stretch and so its smooth muscles will relax and the incoming urine will push against the interior of the bladder resulting in its enlargement



The enlargement is allowed because of the epithelium as the cells no longer appear rounded but flattened

Transitional epithelium

At first you would assume that it's stratified cuboidal and although it looks like it it's not it's just transitional



- A single layer of small basal cells resting on a very thin basement membrane,
- An intermediate region containing from one to several layers of cuboidal or low columnar cells, and
- A superficial layer of large bulbous or elliptical umbrella cells, sometimes binucleated, which are highly differentiated to protect the underlying cells against the potentially cytotoxic effects of hypertonic urine.

Looking at a section of a full urinary bladder the cells appear to be more squamous then we might assume it's stratified squamous but yet again it's not it's just transitional epithelium

Binucleation is quite common but does not appear in all the cells it also protects the inner layers from the toxicity of the urine inside the urinary bladder

Aside from the many layers we can distinguish the transitional epithelium by some of the superficial cells which have binucleations and are actually called the umbrella cells

Major Feature	Cell Form	Examples of Distribution	Main Function
Simple (one layer of cells)	Squamous	Lining of vessels (endothelium); Serous lining of cavities: pericardium, pleura, peritoneum (mesothelium)	Facilitates the movement of the viscera (mesothelium), active transport by pinocytosis (mesothelium and endothelium), secretion of biologically active molecules (mesothelium)
	Cuboidal	Covering the ovary, thyroid	Covering, secretion
	Columnar	Lining of intestine, gallbladder	Protection, lubrication, absorption, secretion
Stratified (two or more layers of cells)	Squamous keratinized (dry)	Epidermis	Protection; prevents water loss
	Squamous nonkeratinized (moist)	Mouth, esophagus, larynx, vagina, anal canal	Protection, secretion; prevents water loss
	Cuboidal	Sweat glands, developing ovarian follicles	Protection, secretion
	Transitional	Bladder, ureters, renal calyces	Protection, distensibility
	Columnar	Conjunctiva	Protection
Pseudostratified (layers of cells with nuclei at different levels; not all cells reach surface but all adhere to basal lamina)		Lining of trachea, bronchi, nasal cavity	Protection, secretion; cilia- mediated transport of particles trapped in mucus out of the air passages

1) Which of the following statements best describes the difference between epithelium in oral cavity and the cornea ?

- A) The cornea epithelium requires more protection
- B) The oral cavity epithelium requires more protection
- C) Both the oral cavity and cornea epithelium requires equal levels of protection
- D) The cornea epithelium is more resistance to damage compared to the oral cavity epithelium

2) Which type of epithelium is described as having dead cells in its most superficial layer ?

- A) Simple squamous epithelium
- B) Simple cuboidal epithelium
- C) Stratified squamous keratinized epithelium
- D) Stratified columnar epithelium
- E) A+C

3) Which type of epithelium is primarily found in the Conjunctive ?

- A) Simple squamous epithelium
- B) Simple cuboidal epithelium
- C) Stratified squamous epithelium
- D) Stratified columnar epithelium

4) Where is stratified cuboidal epithelium primarily found ?

- A) Skin
- B) Intestines
- C) Salivary glands
- D) Lining of blood vessels

5) What is a notable characteristic of the superficial cells of translational epithelium?

- A) Uninucleated
- B) Binucleated
- C) Multinucleated
- D) Lack of nuclei

6) What are the superficial cells of transitional epithelium ?

- A) Cuboidal cells
- B) Squamous cells
- C) Umbrella cells
- D) Ciliated cells
- E) Cap cells

7) What are some characteristics of the stratified columnar epithelium~ and where is it comunly found

- 1) B
- 2) C
- 3) D
- 4) C
- 5) B
- 6) C
- 7) Ceratin
ducts