The module: Tissue of the Body (TOB)
Session 3 Lecture No. 1
Duration: 1h.

Epithelial tissue P 2

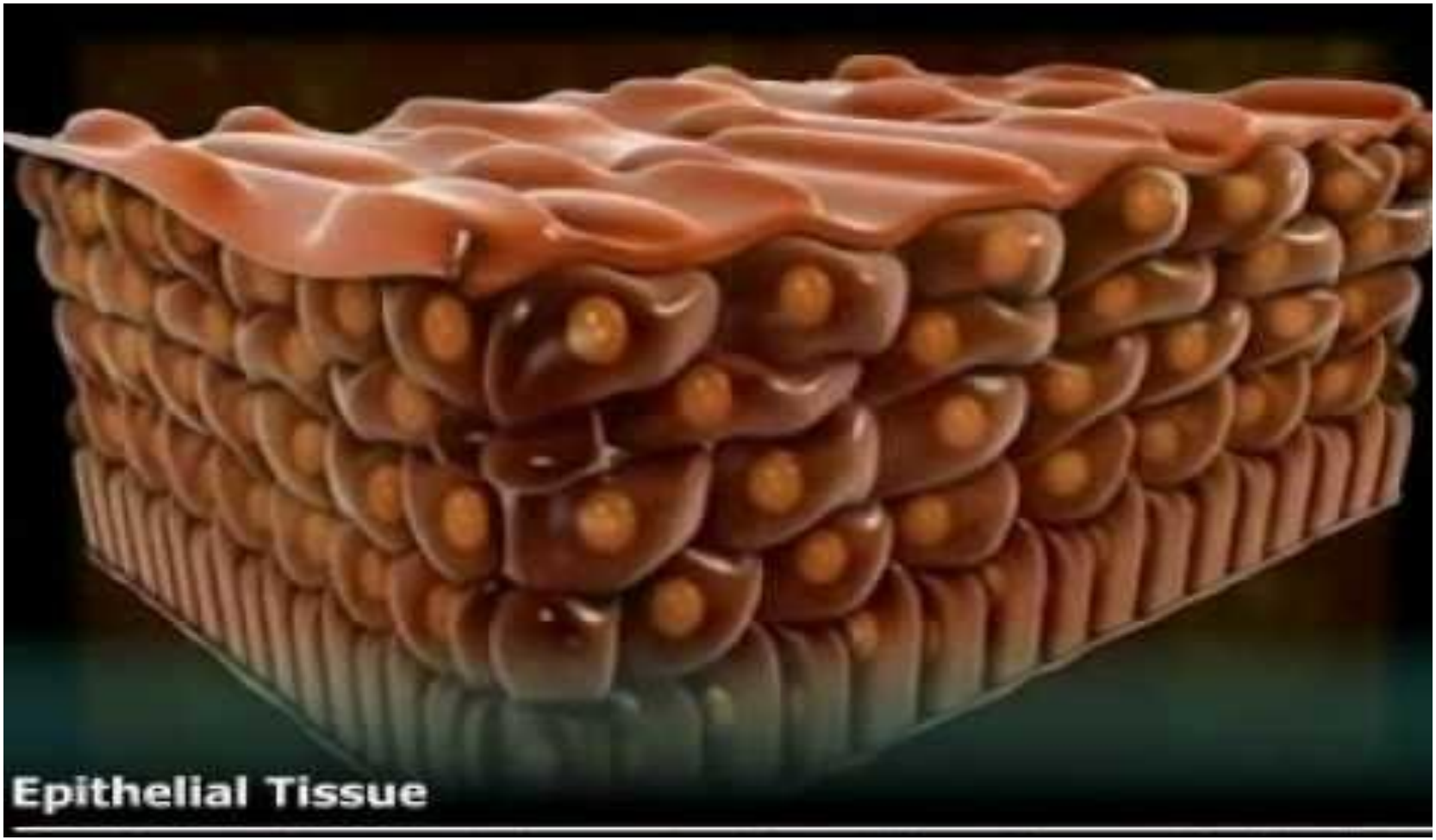
Module staff : Nawal Mustafa Abdullah

Dr Ghada Lateef (module leader) Dr: Hussien Katai
Dr. Nada Hashim AlJasimn Dr: Ihsan Murdan
Dr Hameed Abbas Dr :Rafid mousa
Dr Farqad M Alhamadani Dr:Raed Jasib
Dr Ilham M Jawad Dr: Falih waleed
Dr Ban M Saaed Dr Muntaha Abdul Hadi
Dr Ansam Munadhel

- Color Atlas and Text of Histology Sixth edition
- Junqueiras basic histology text _ atlas

For more detailed instruction, any question, cases need help please post to the group of session.

Epithelium



Learning Objectives

1. Define stratified epithelium
2. Classification of compound epithelium
3. Recognize the different types of surface specialization found on epithelial cells
4. Describe the cell adhesion and types

Stratified epithelium :

Lo1

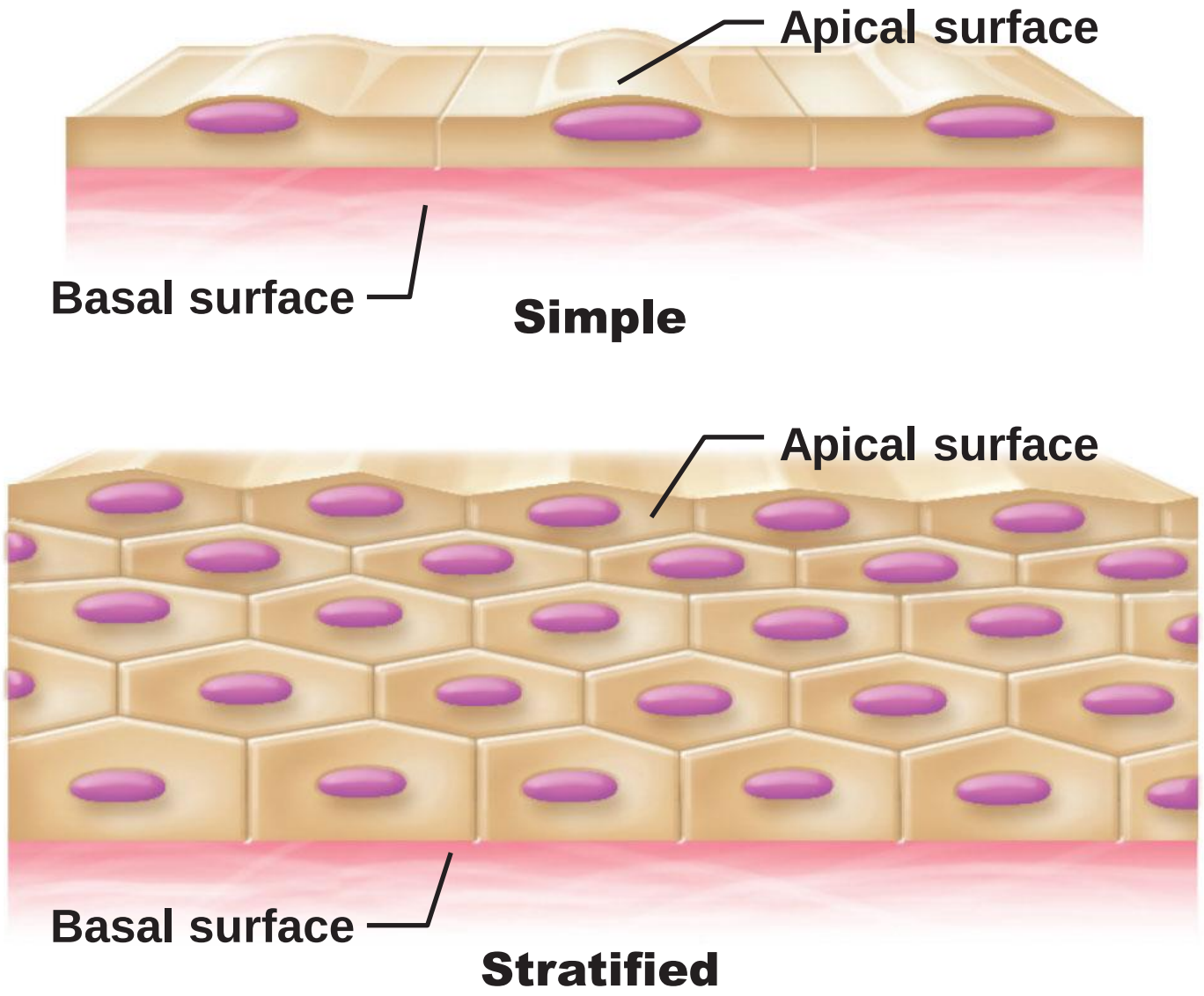
Criteria

More than one layer -

- Found in areas of high abrasions
  e.g: skin , oral cavity

- Cell division occur near the basement membrane pushing older cell toward the surface

- When abrasion happened ,cells lost will be replaced by cells underneath.



(a) Classification based on number of cell layers.

Figure 4.2a

Classification:

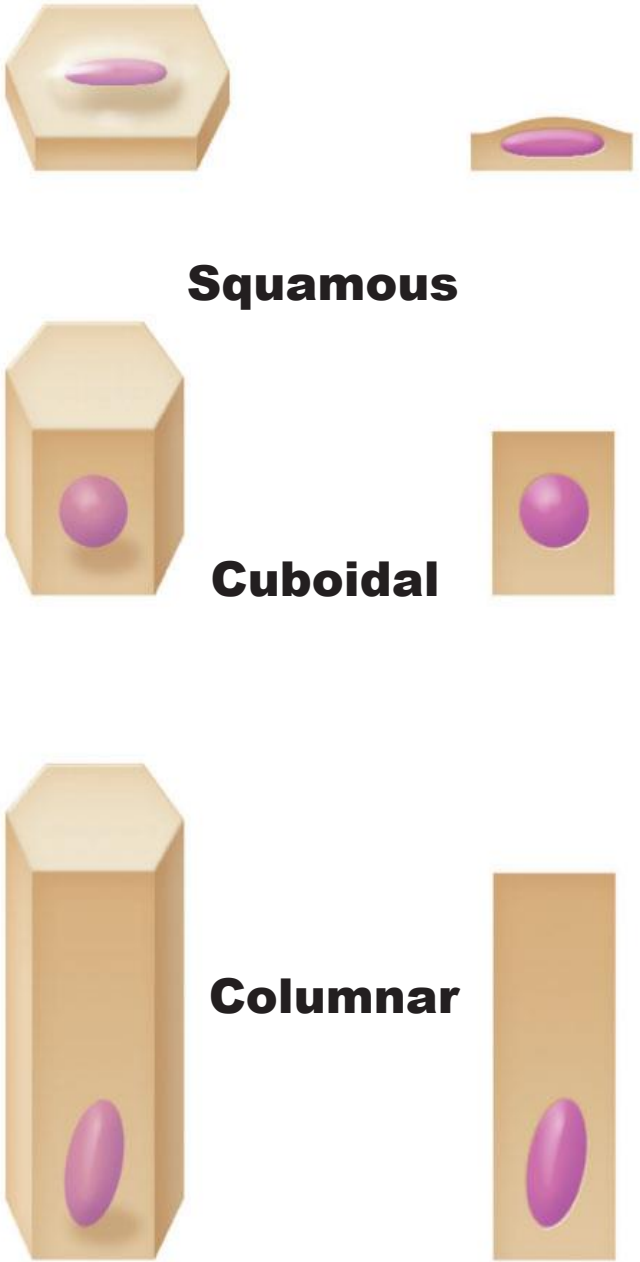
According to the <u>shape</u> of the <u>superficial layer:</u>

1- Squamous

2- cuboidal

3- columnar

4- transitional



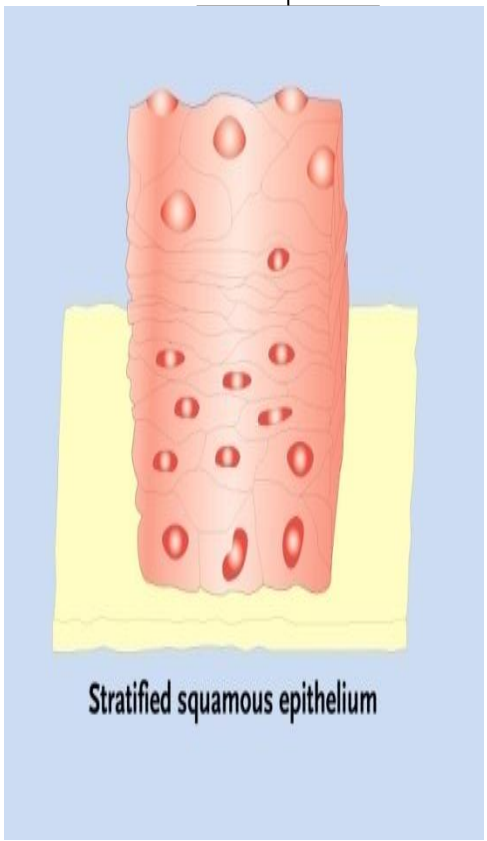
(b) Classification based on cell shape.

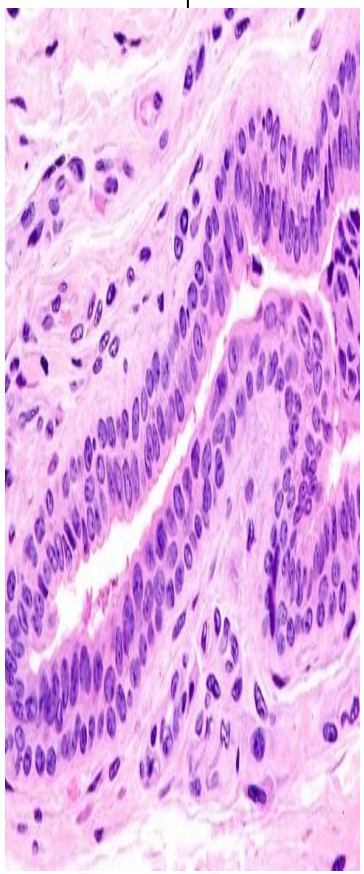
For each of the following types of epithelia, note:
Description
Function
Location

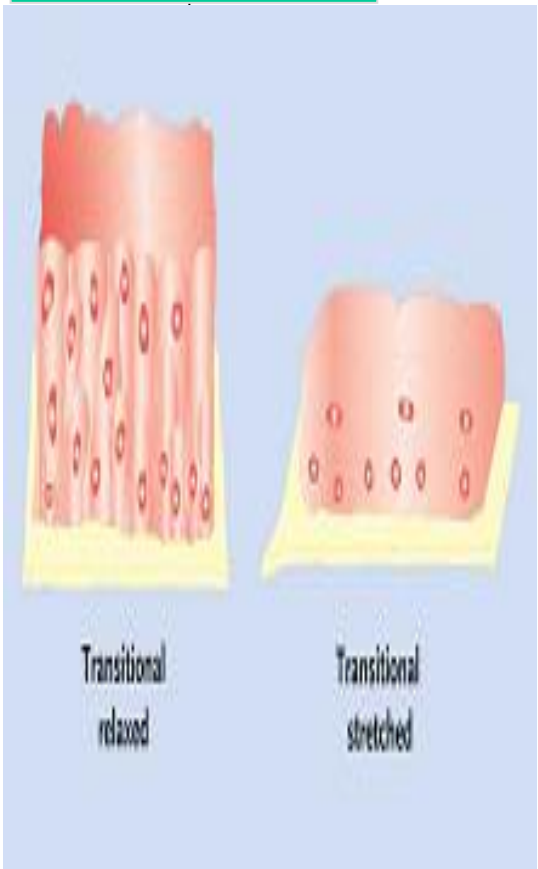
LO 2

COMPOUND EPITHELIA

- SQUAMOUS
- CUBOIDAL
- COLUMNAR
- TRANSITIONAL





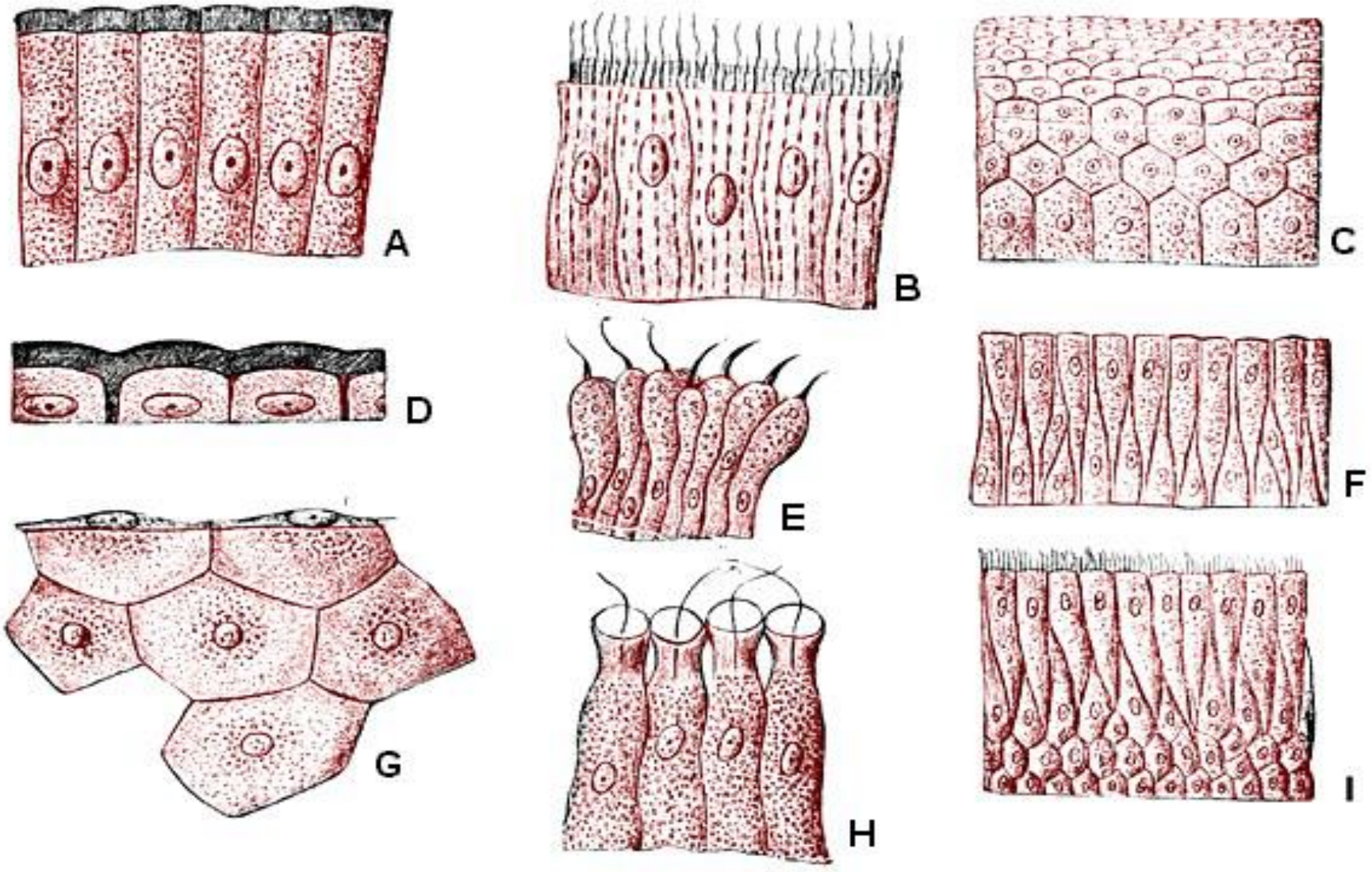


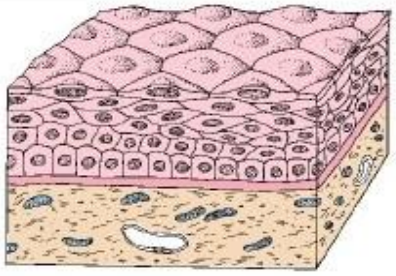
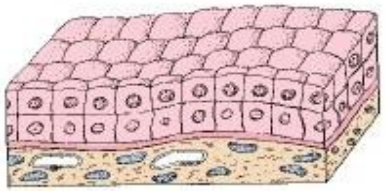
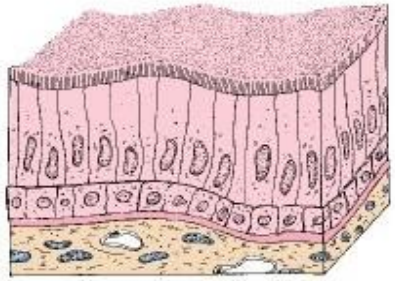
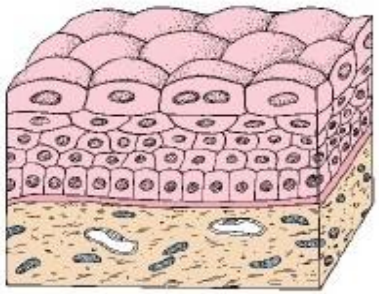
Color Atlas and Text of Histology Sixth edition

- Junqueiras basic histology text _ atlas

LO 2

Types:



	Type	Location	Function
	Stratified squamous	Epidermis Oral cavity and esophagus Vagina	Barrier, protection
	Stratified cuboidal	Sweat gland ducts Large ducts of exocrine glands Anorectal junction	Barrier, conduit
	Stratified columnar	Largest ducts of exocrine glands Anorectal junction	Barrier, conduit
	Transitional (urothelium)	Renal calyces Ureters Bladder Urethra	Barrier, distensible property

LO2

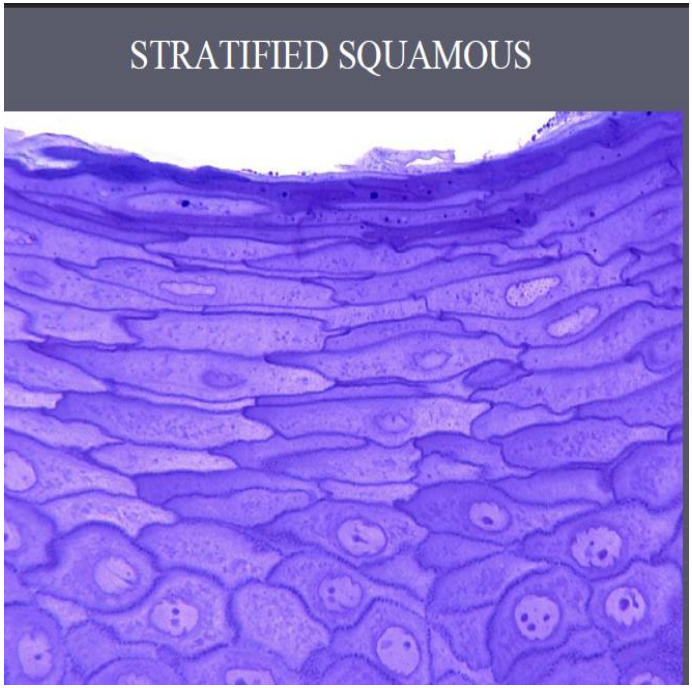
Stratified squamous epithelium:

Several layers of cells:

- top layer is flat

- bottom layer vary from cuboidal to columnar

- basal layer continually replicate protect against abrasions



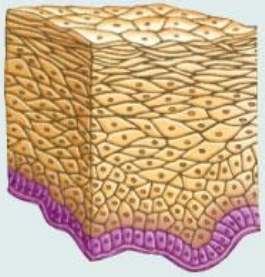
- Color Atlas and Text of Histology Sixth edition
- Junqueiras basic histology text _ atlas

For more detailed instruction, any question, cases need help please post to the group of session.

Stratified squamous epithelium

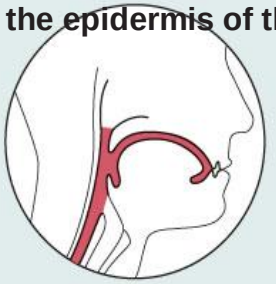
LO2

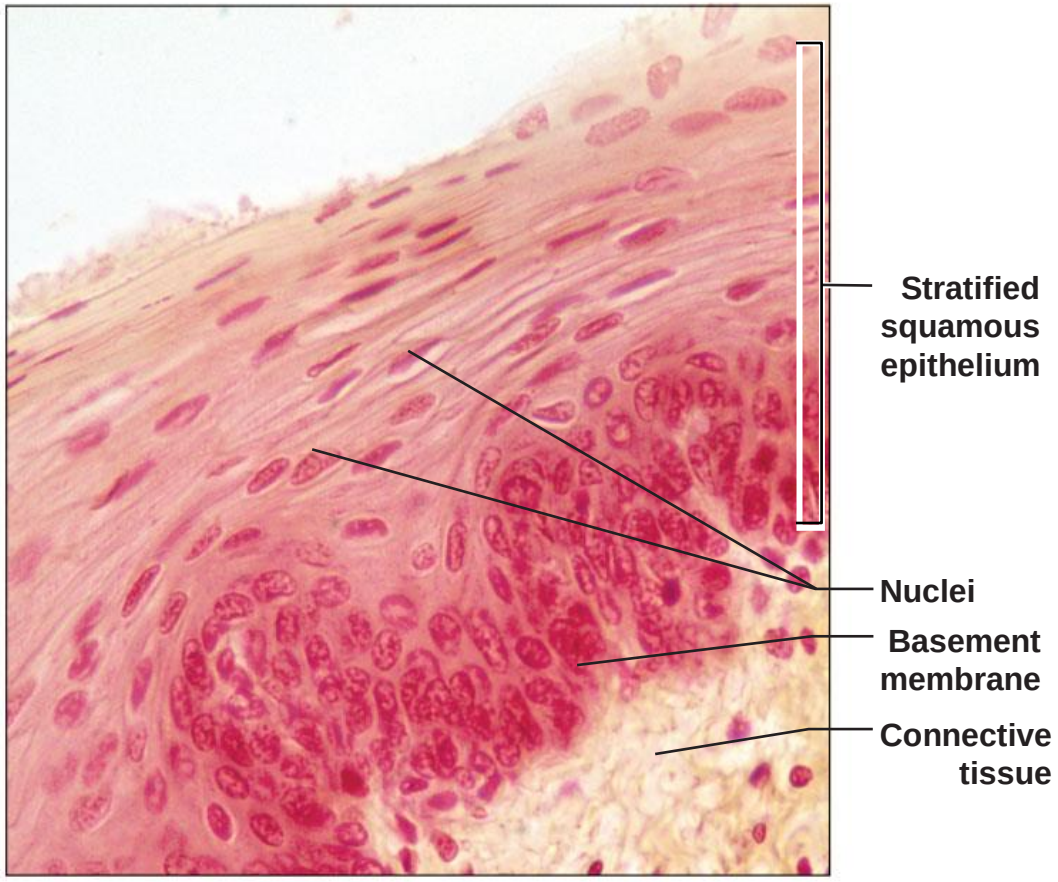
Description:
Thick membrane composed of several cell layers; basal cells are cuboidal or columnar and metabolically active; surface cells are flattened (squamous); in the keratinized type, the surface cells are full of keratin and dead; basal cells are active in mitosis and produce the cells of the more superficial layers.



Function: Protects underlying tissues in areas subjected to abrasion.

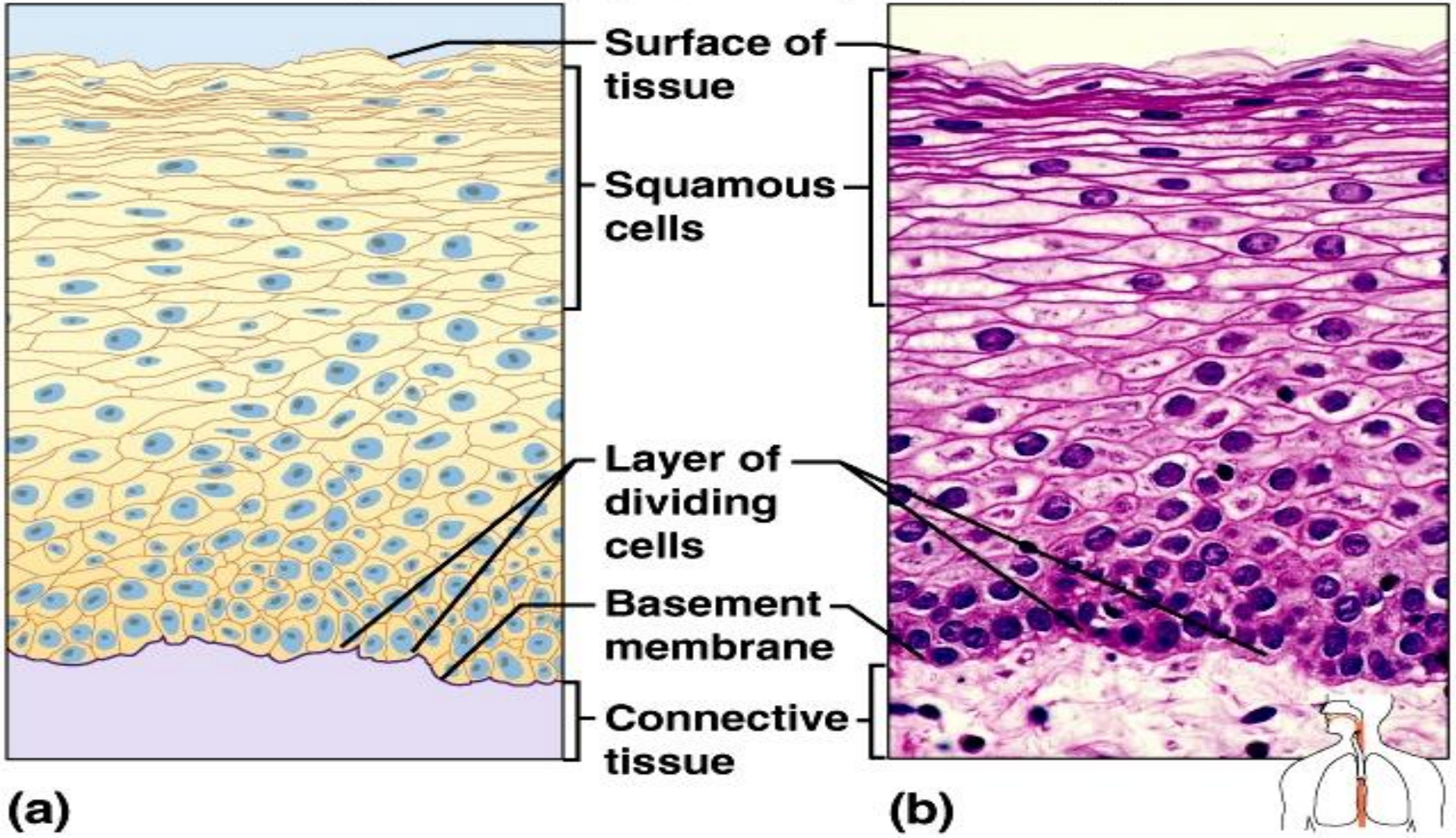
Location: Nonkeratinized type forms the moist linings of the esophagus, mouth, and vagina; keratinized variety forms the epidermis of the skin, a dry membrane.





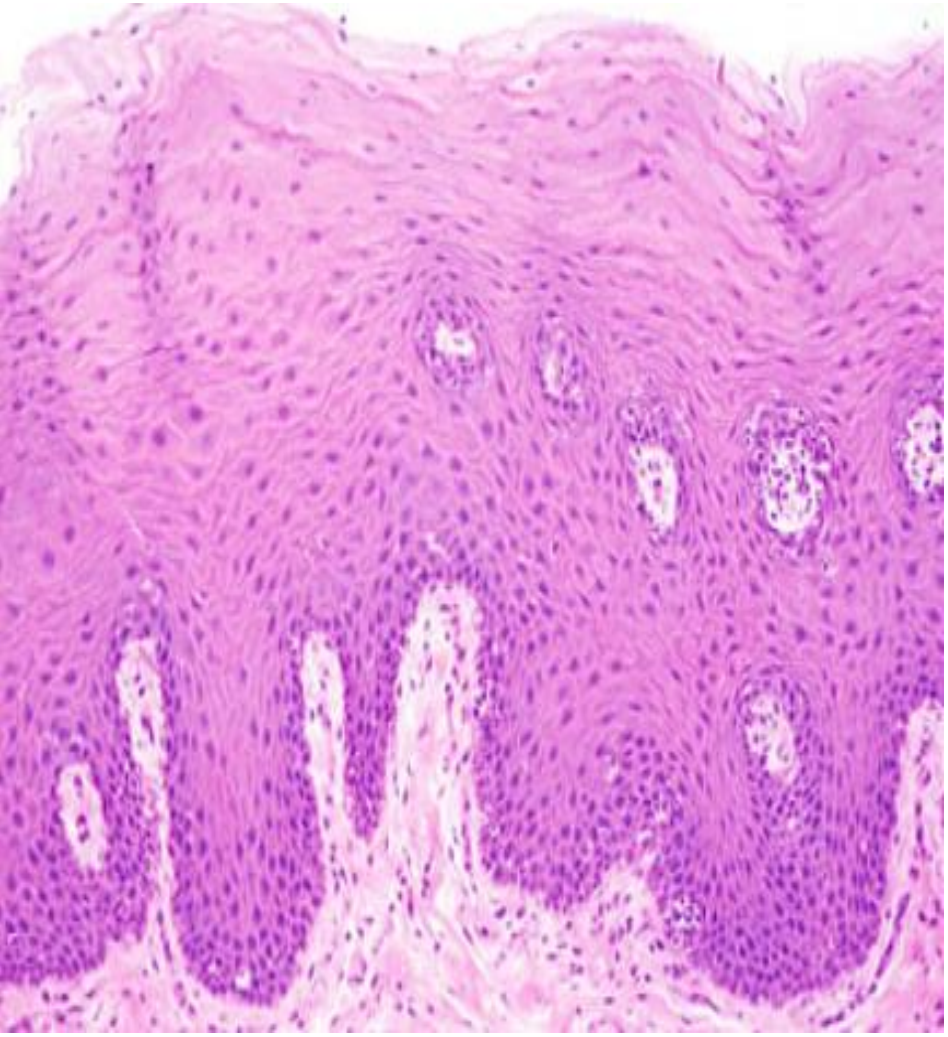
Photomicrograph: Stratified squamous epithelium lining the esophagus (285x).

LO 2



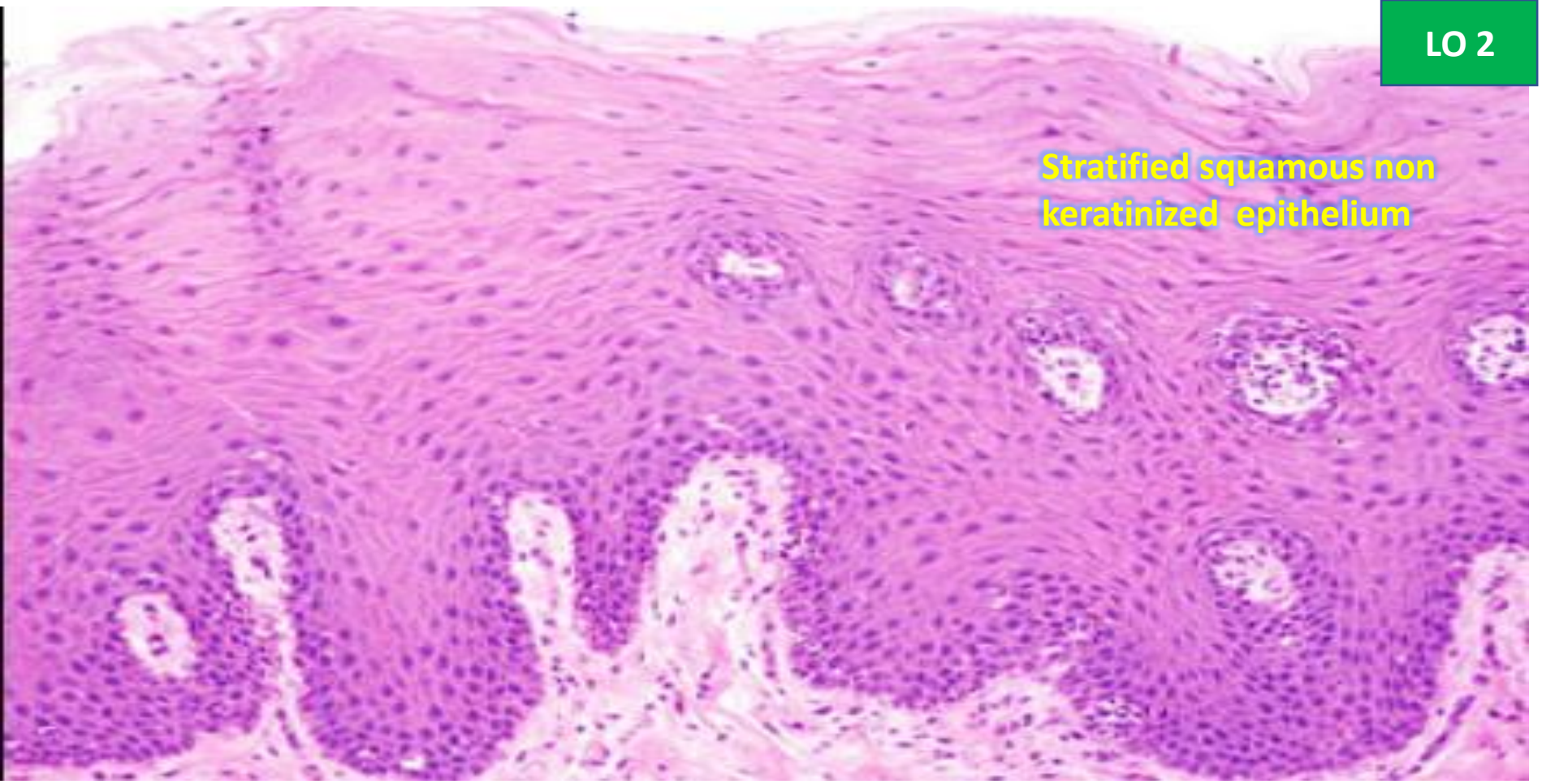
A: Stratified squamous epithelium (non keratinized)

LO2



- In stratified squamous epithelium the lower cells are roughly polygonal in shape.
- As cells migrate towards the surface they become flattened.
- Found in areas requiring protection such as oesophagus, anal canal and vagina.

LO 2



Note how cells at the surface are very flattened as opposed to the nearly columnar basal cells. Surface cells are continuously lost and replaced by cell division in deeper layers

LO 2

B) Keratinized stratified epithelium:

-***Description:***

variety forms , Its cells form many layers , and the **cells** closer to the underlying connective tissue are usually **cuboidal** or low **columnar**

The cells become irregular in shape and flatten as they accumulate keratin in the process of keratinization

- moved progressively closer to the surface where they become thin

Functions:

contains **protein** keratin. **waterproof**,

resistant to friction, helps repel bacteria .

metabolically inactive squamous , keratin lacking nuclei

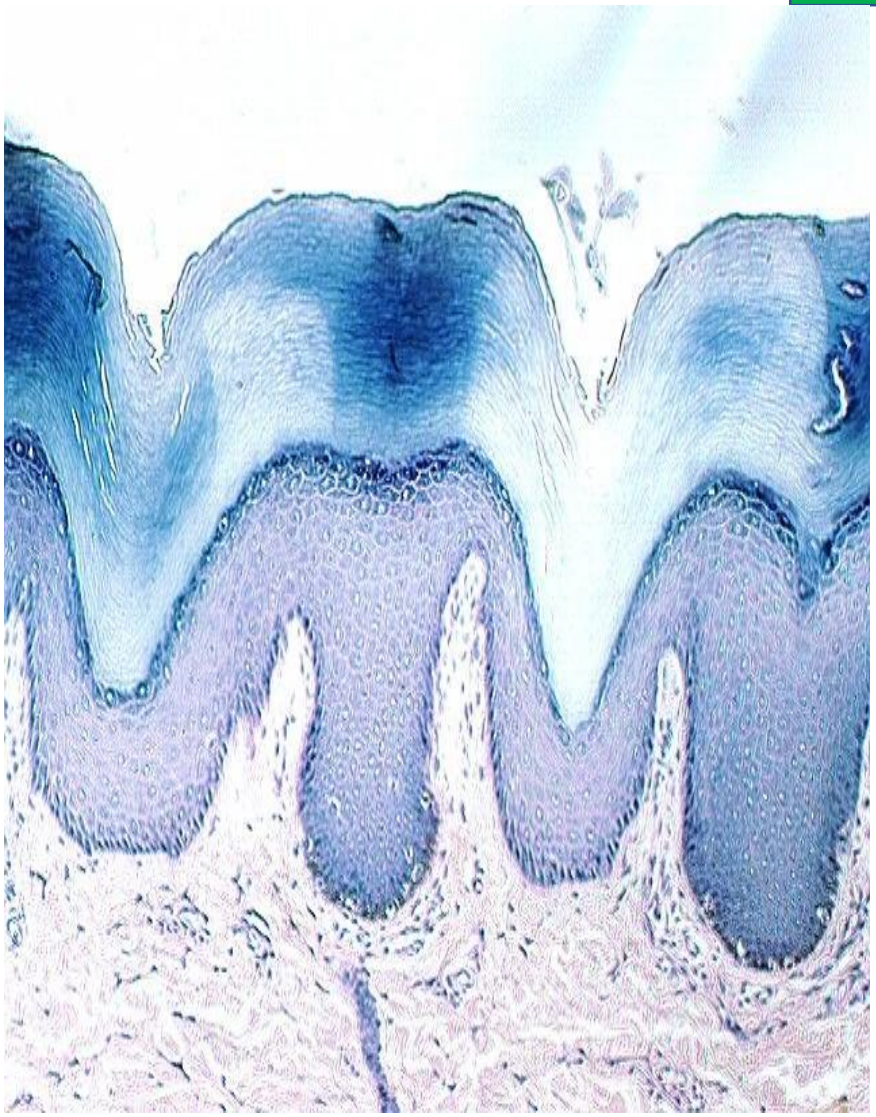
this surface layer of cells helps protect against water loss across this epithelium

Location:

-found mainly in the **epidermis of skin**.

Stratified squamous keratinized epithelium

LO 2



LO 2

2)Stratified cuboidal epithelium

- Desciption:

Quite rare in body

consists of several layers of cells in which the top layer is cub shaped

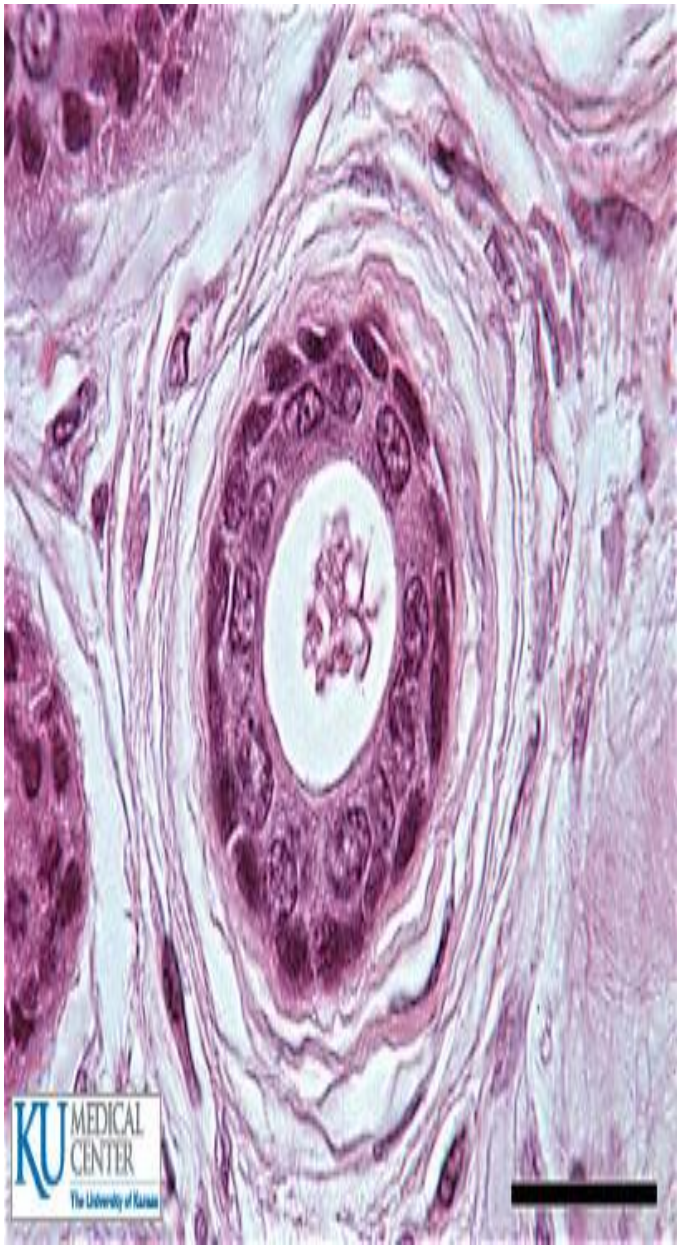
- Function:

is mainly **protective.????**

Location:-

Testis tubules; vesicular (Graafian) follicles of ovary.

Ducts of sweat glands; sebaceous glands mammary glands



Lo2

3- Stratified columnar epithelium :

Criteria

Desciption:

- Rare

Several layers of cells in which the top layer is rectangular -

- **Basal layer cells are short irregular and poly hydral**

Function

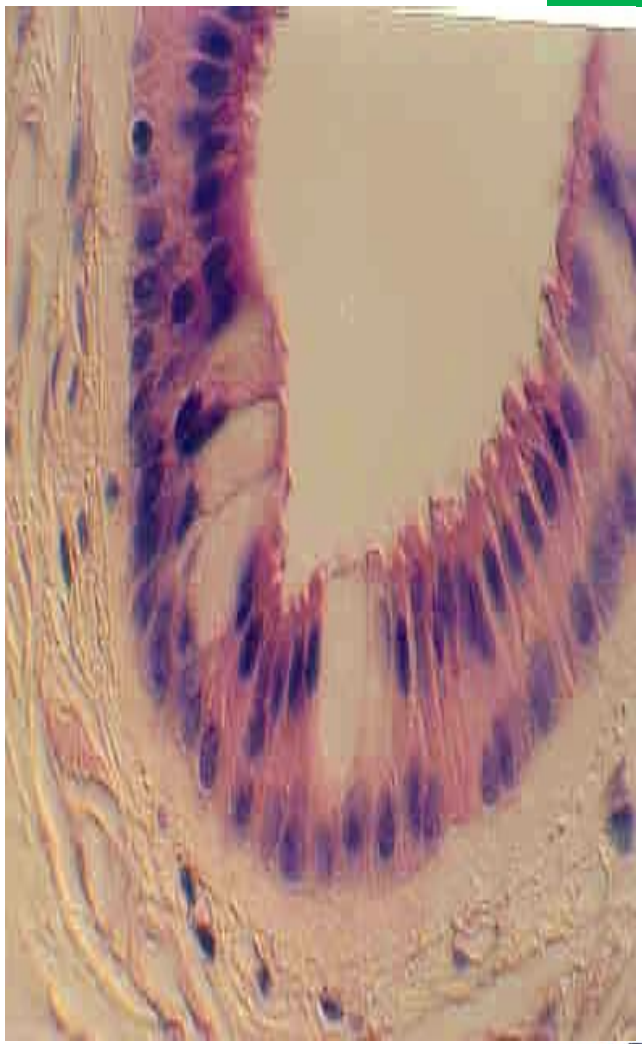
Secretion and protection

Location

Conjuctiva ,lining of the eye lids

Small amounts in pharynx, male urethra, and lining some glandular ducts

Also occurs at transition areas between two other types of epithelia



Transitional epithelium

Lo2

Description:

Resembles both

Resemble both stratified squamous and stratified cuboidal , Basal cells are cuboidal or columnar surface , cells have dome shaped or squamous like, depending on degree of organ stretch

Function:

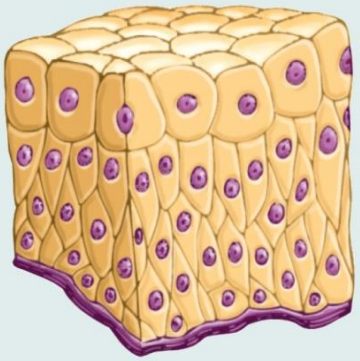
Stretches readily and permits distension of urinary organ by contained urine

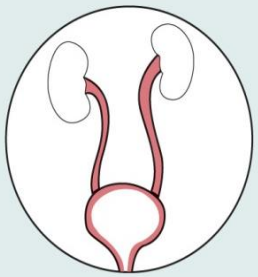
.

Location: Lines the ureters, urinary bladder and part of urethra

4 . Transitional epithelium

Lo2





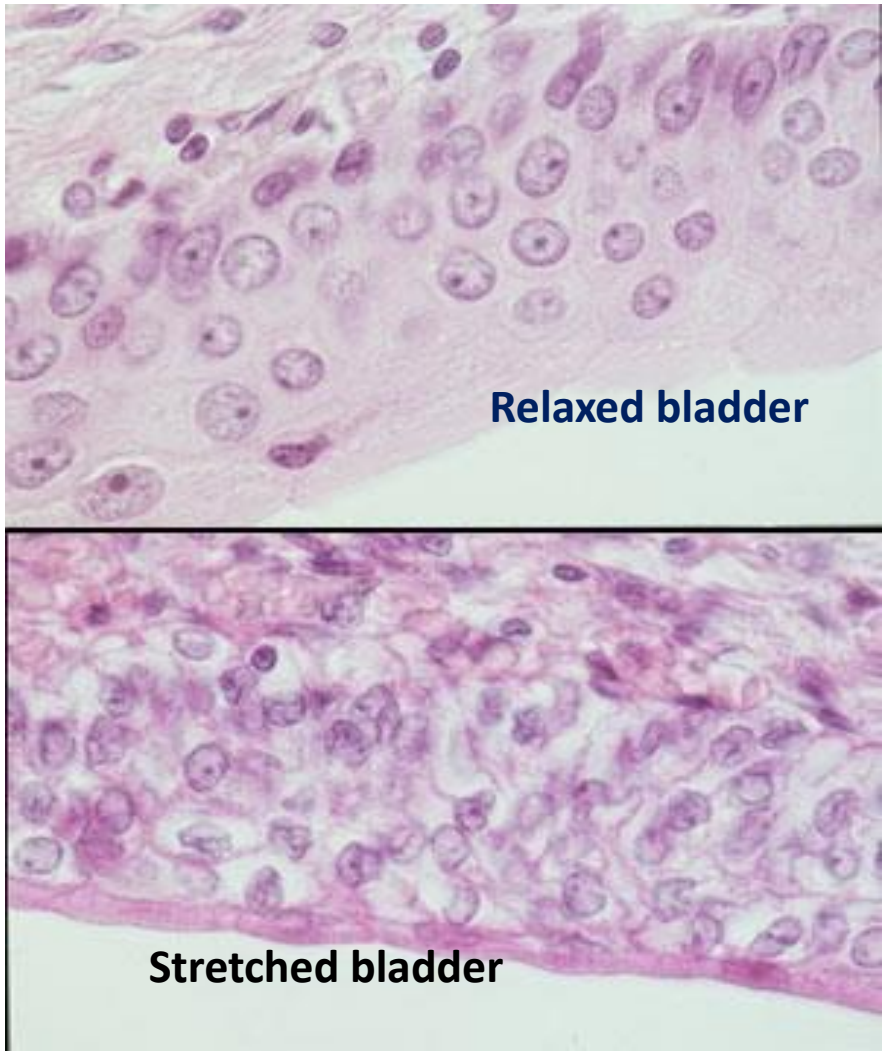
Photomicrograph: Transitional epithelium lining the urinary bladder, relaxed state (360X); note the bulbous, or rounded, appearance of the cells at the surface; these cells flatten and become elongated when the bladder is filled with urine.

Figure 4.3f

Transitional epithelium

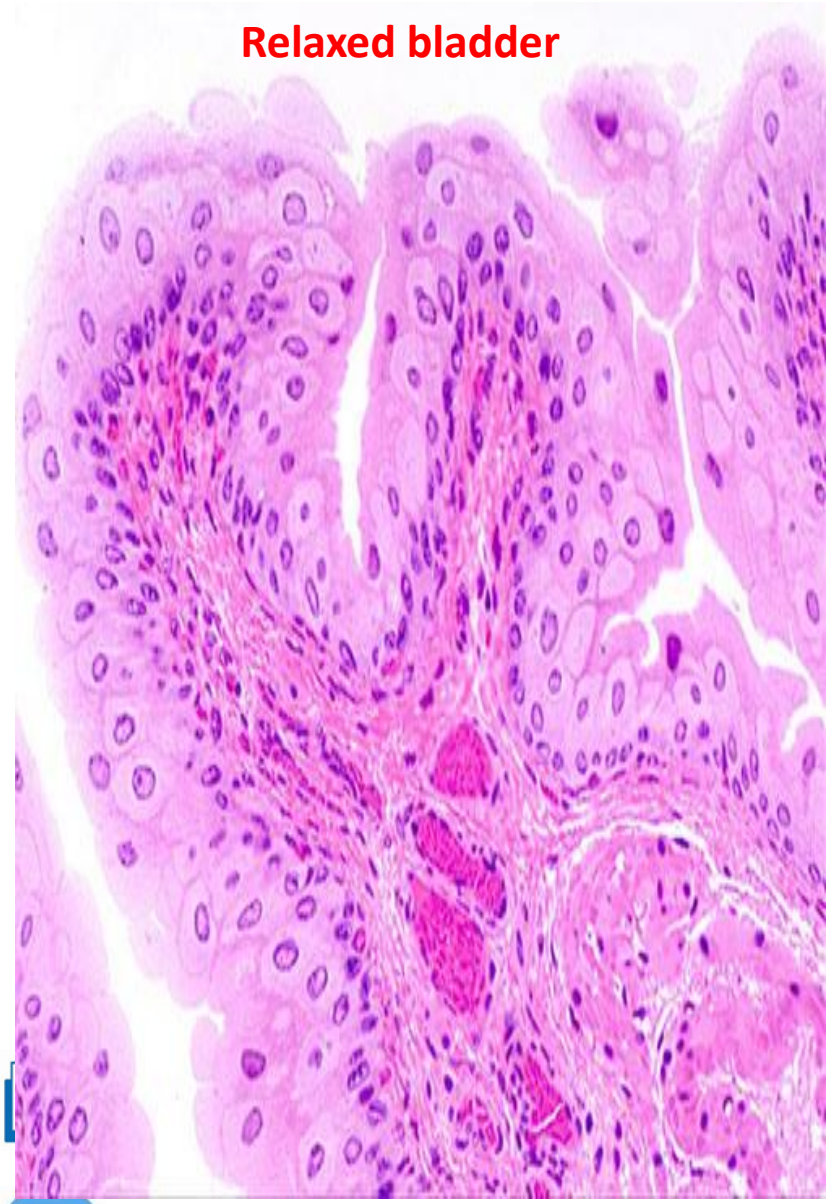
Lo2

- When bladder is **empty** the superficial layer has umbrella cells
- When bladder is **full** the
- Urothelium is thinner and umbrella cells are flatter

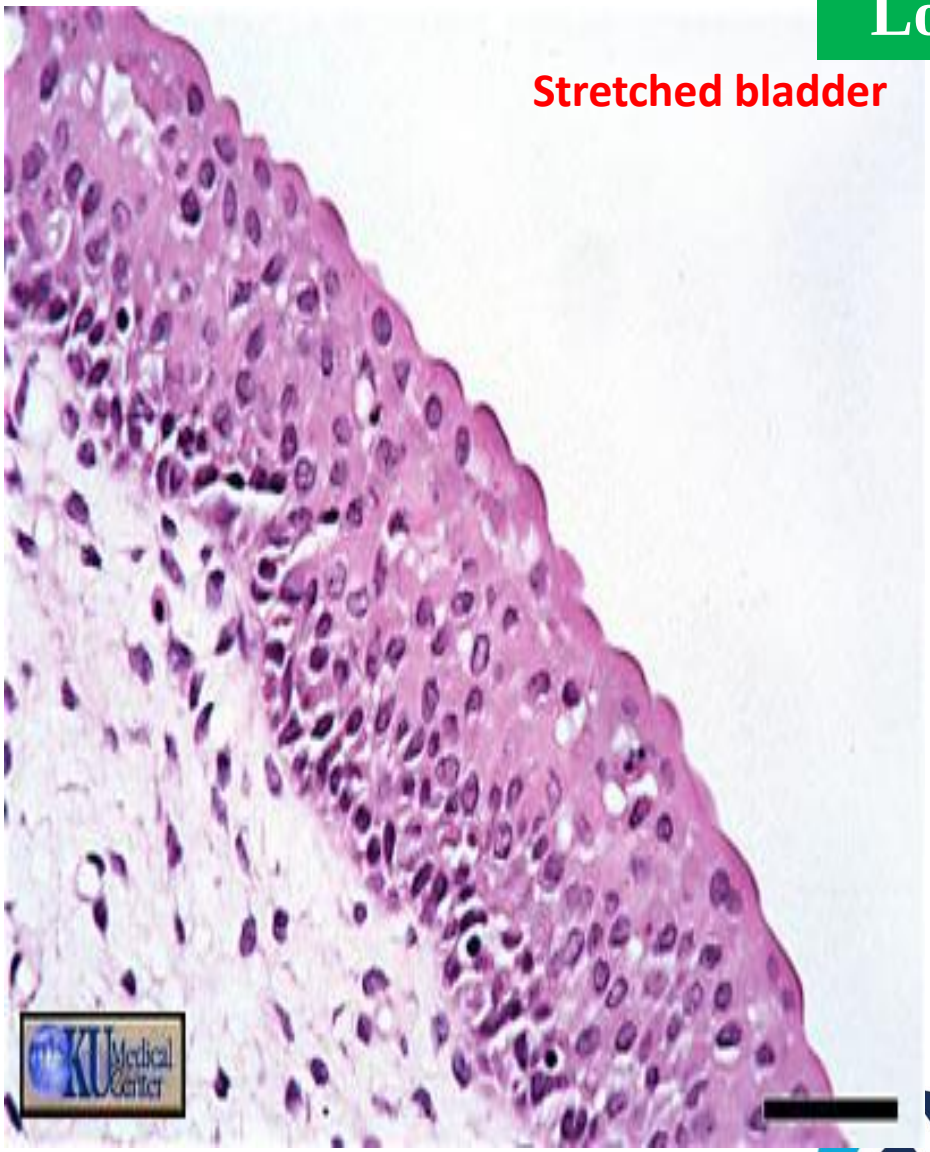


Lo2

Relaxed bladder

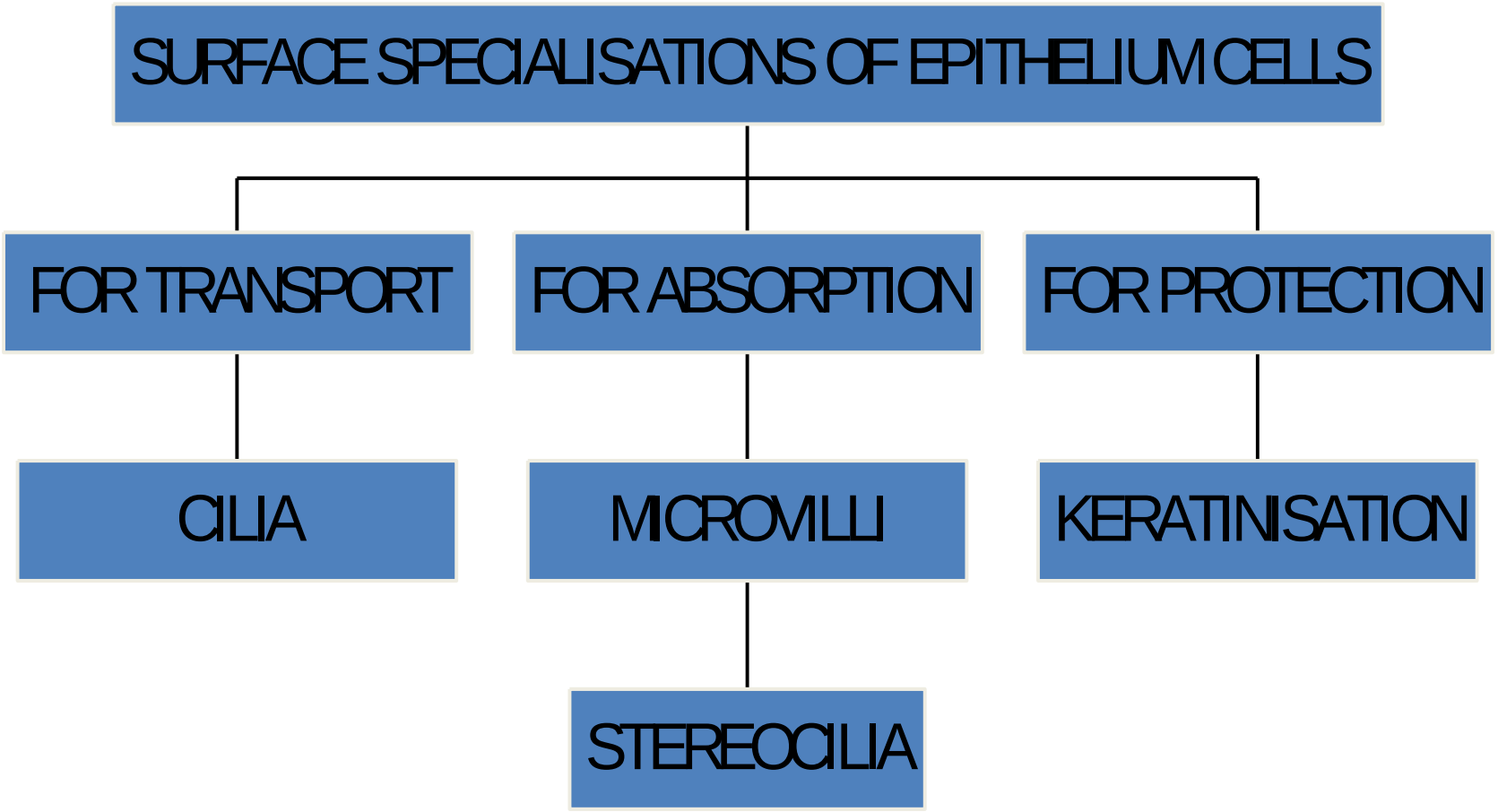


Stretched bladder



LO 3

Modification of epithelial structure



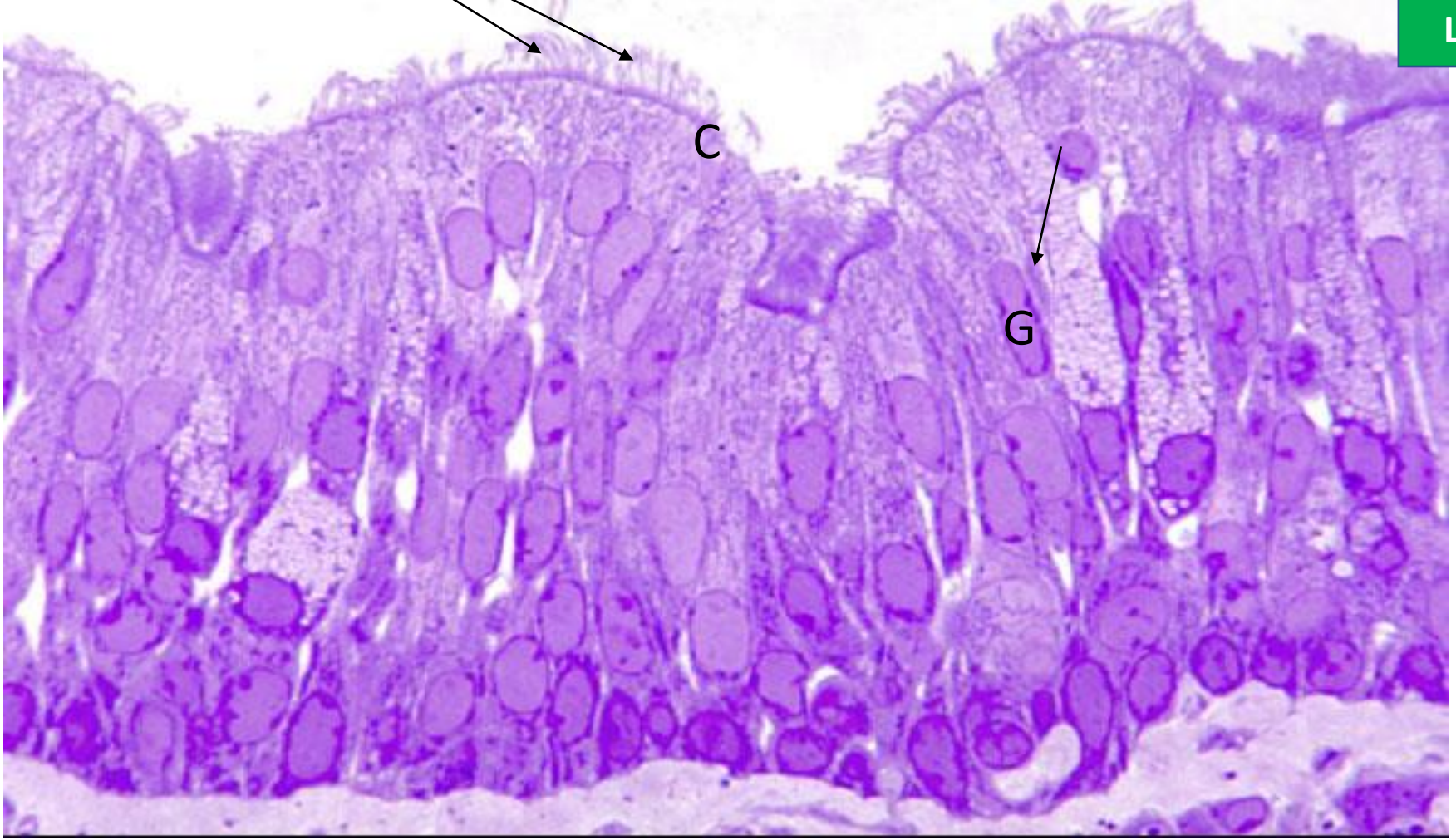
Cilia

Lo3

Def:

surface projections from cells which permit movement of materials / objects over the surface of the epithelium.

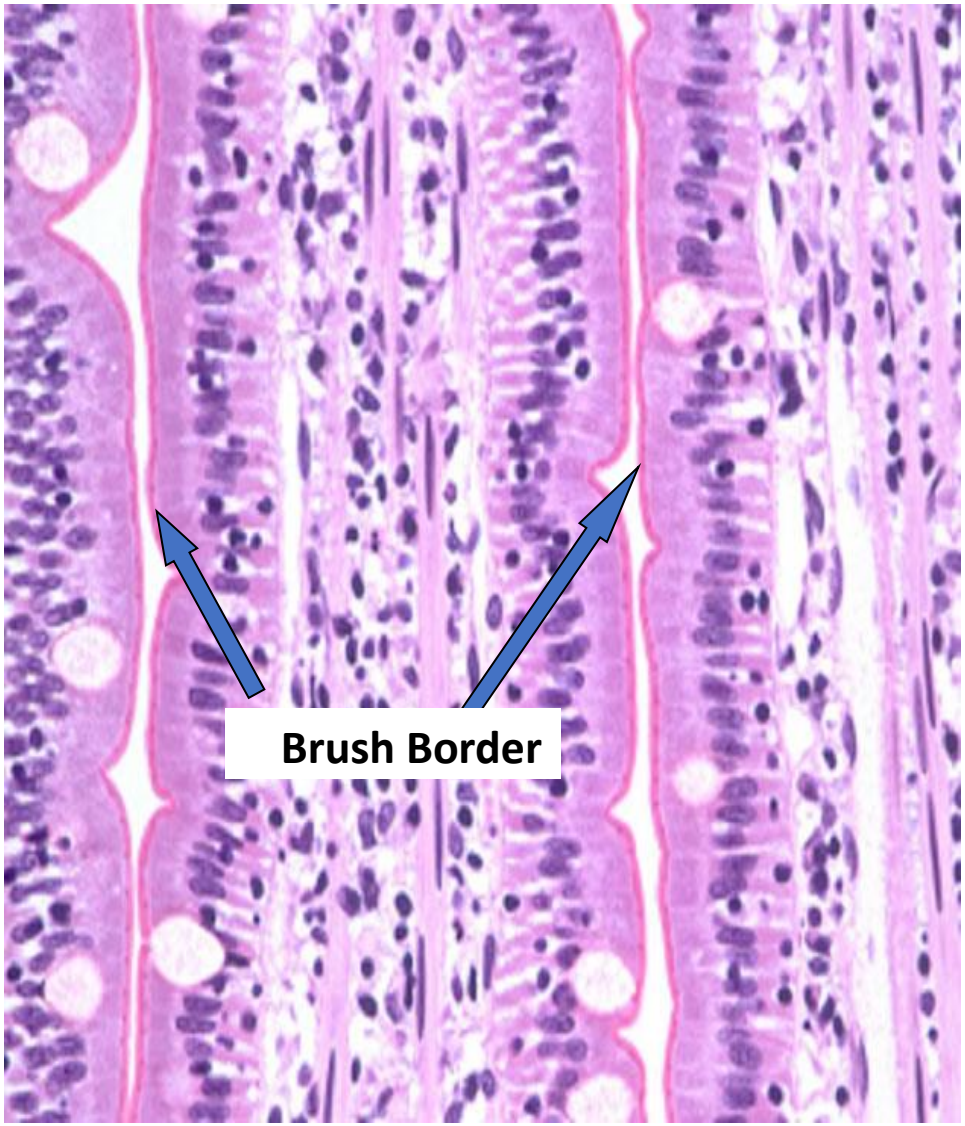
LO 3



Thin epoxy section of the trachea showing cilia (C) on a pseudostratified columnar epithelium (arrows).
Note how the goblet cells (G) between the epithelial cells lack cilia.

Microvill

LO 3



Microvilli (MV):

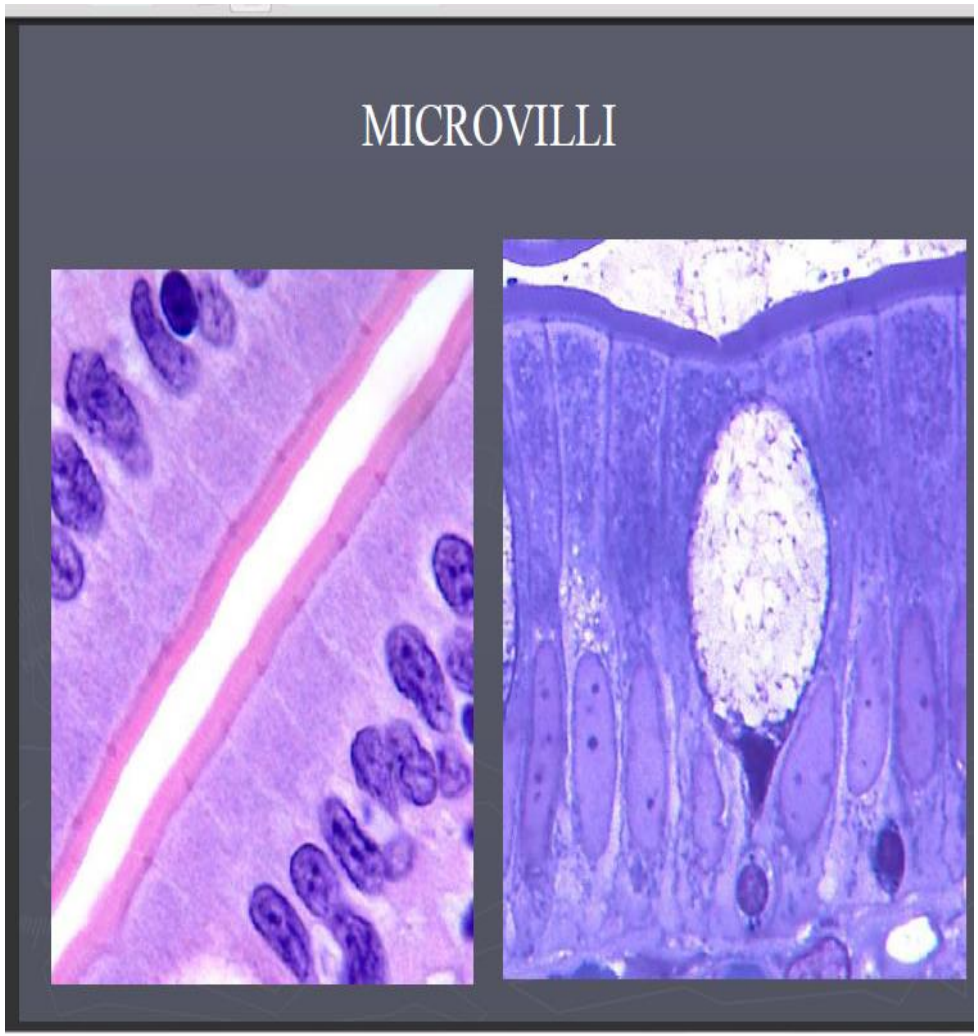
are finger-like projections from the apical surface of (usually columnar) epithelial cells.

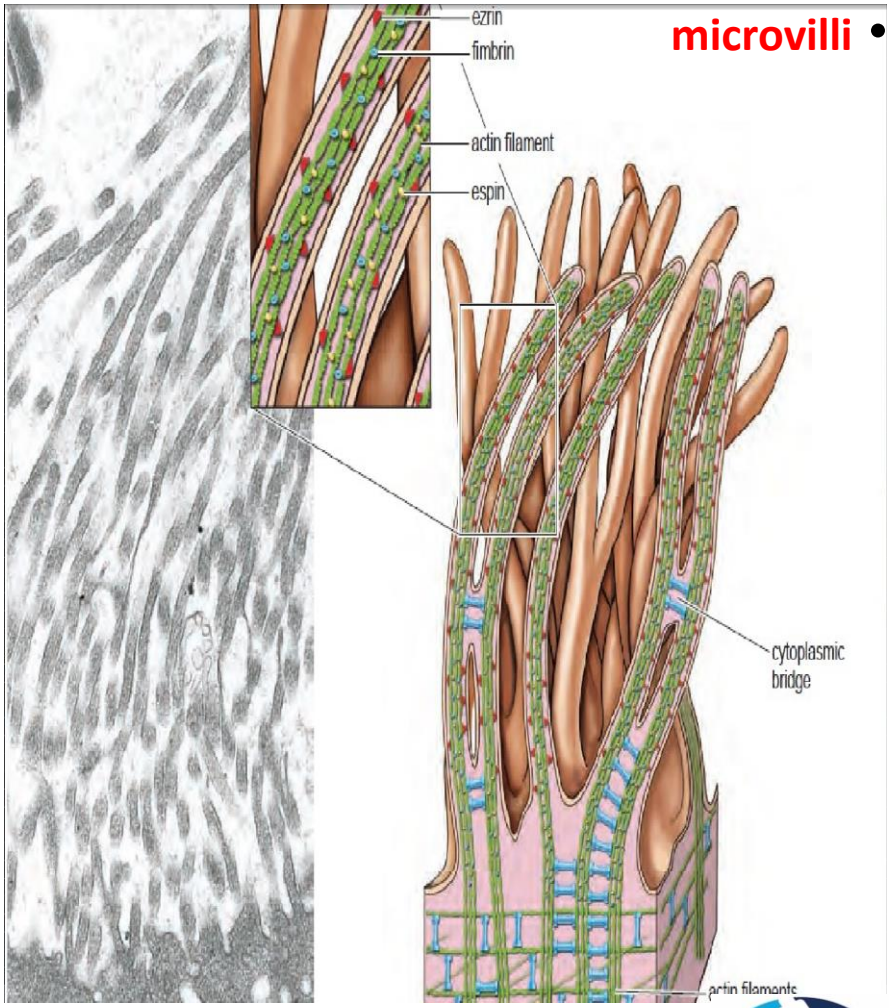
They increase the surface area of the cell surface and are found in areas involved with absorption such as the small intestine and proximal convoluted tubule of the kidney.

In these two areas they are often referred to as a "brush border"

LO 3

Microvilli





- microvilli

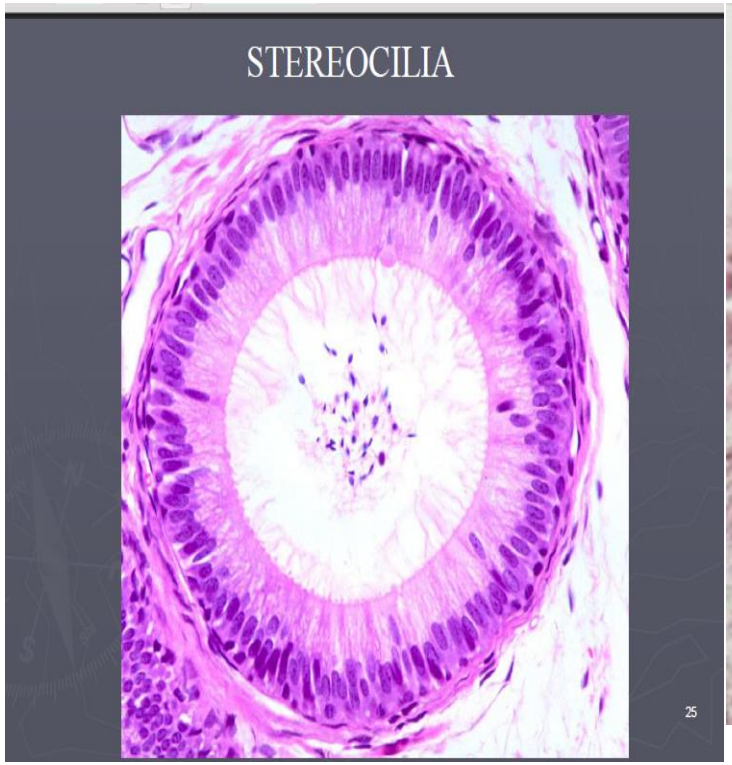
Stereocilia

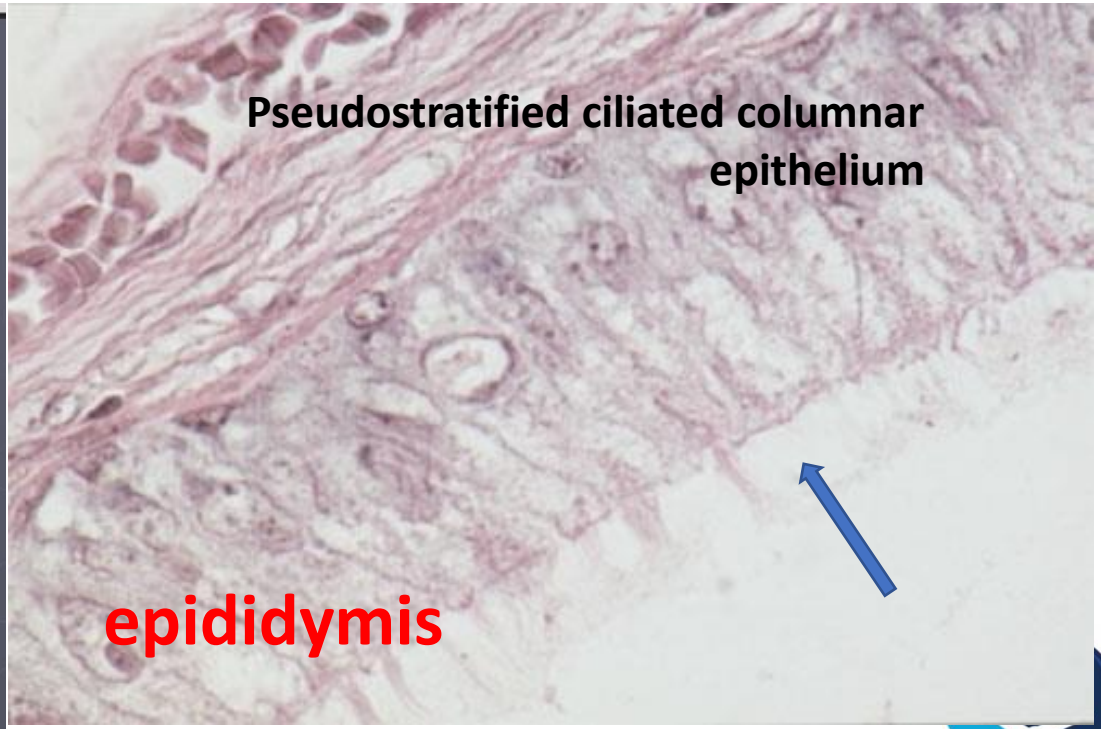
LO 3

Stereocilia:

- are very long, modified microvilli and concerned with <u>absorption.</u>

- They are chiefly found in parts of the <u>male reproductive tract</u>.

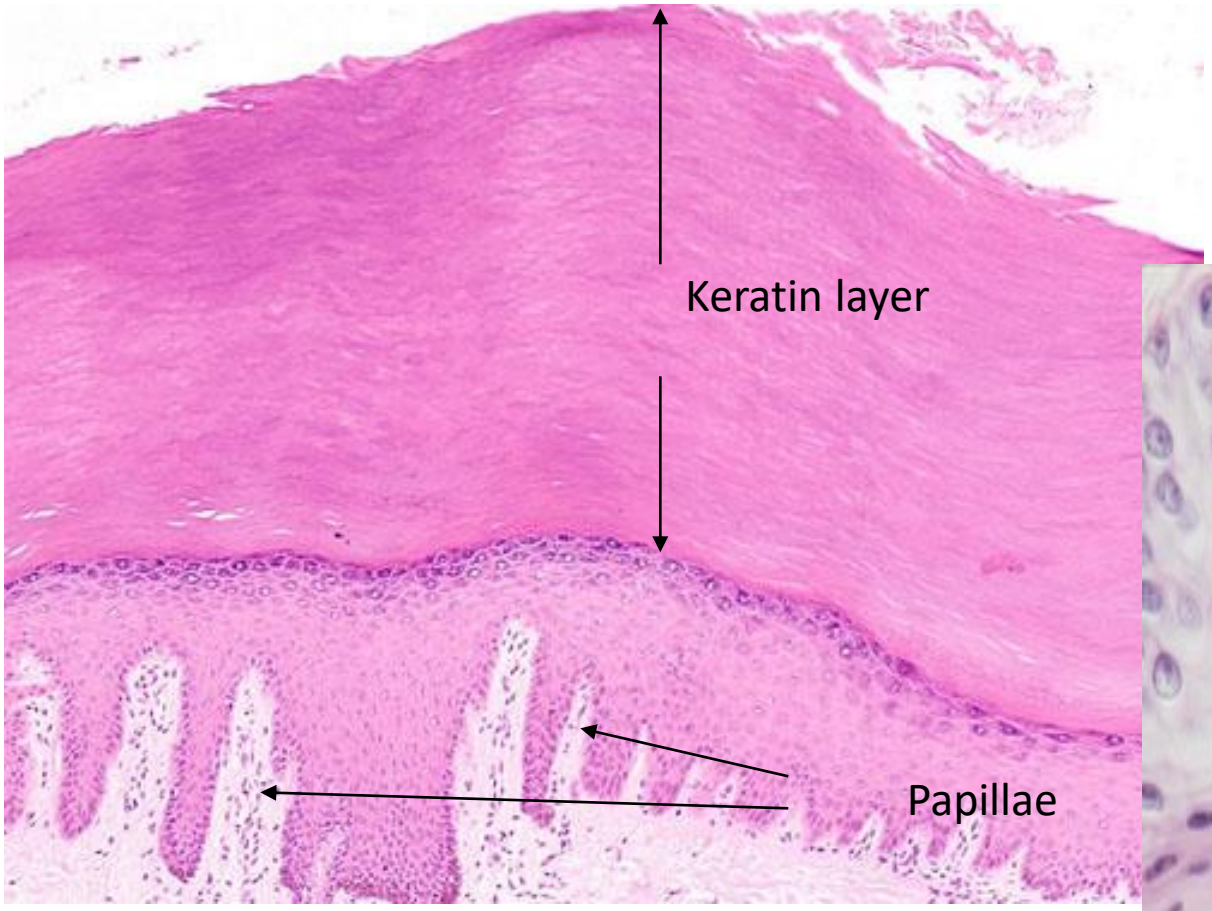


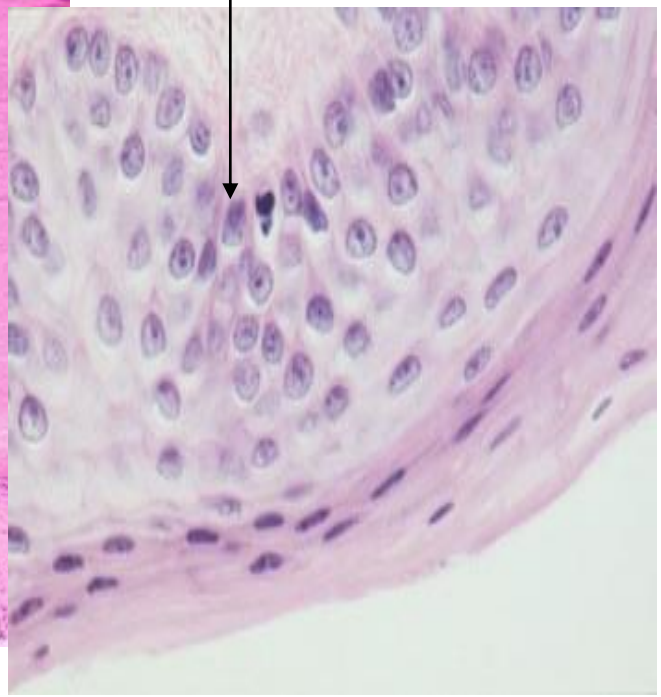


Keratinization

- Characteristically found in the skin, this adaptation is for protection.
- The thickness of the keratin layer varies
- It is thickest in the sole of the foot and thinnest on the outer surface of the lip.

LO 3





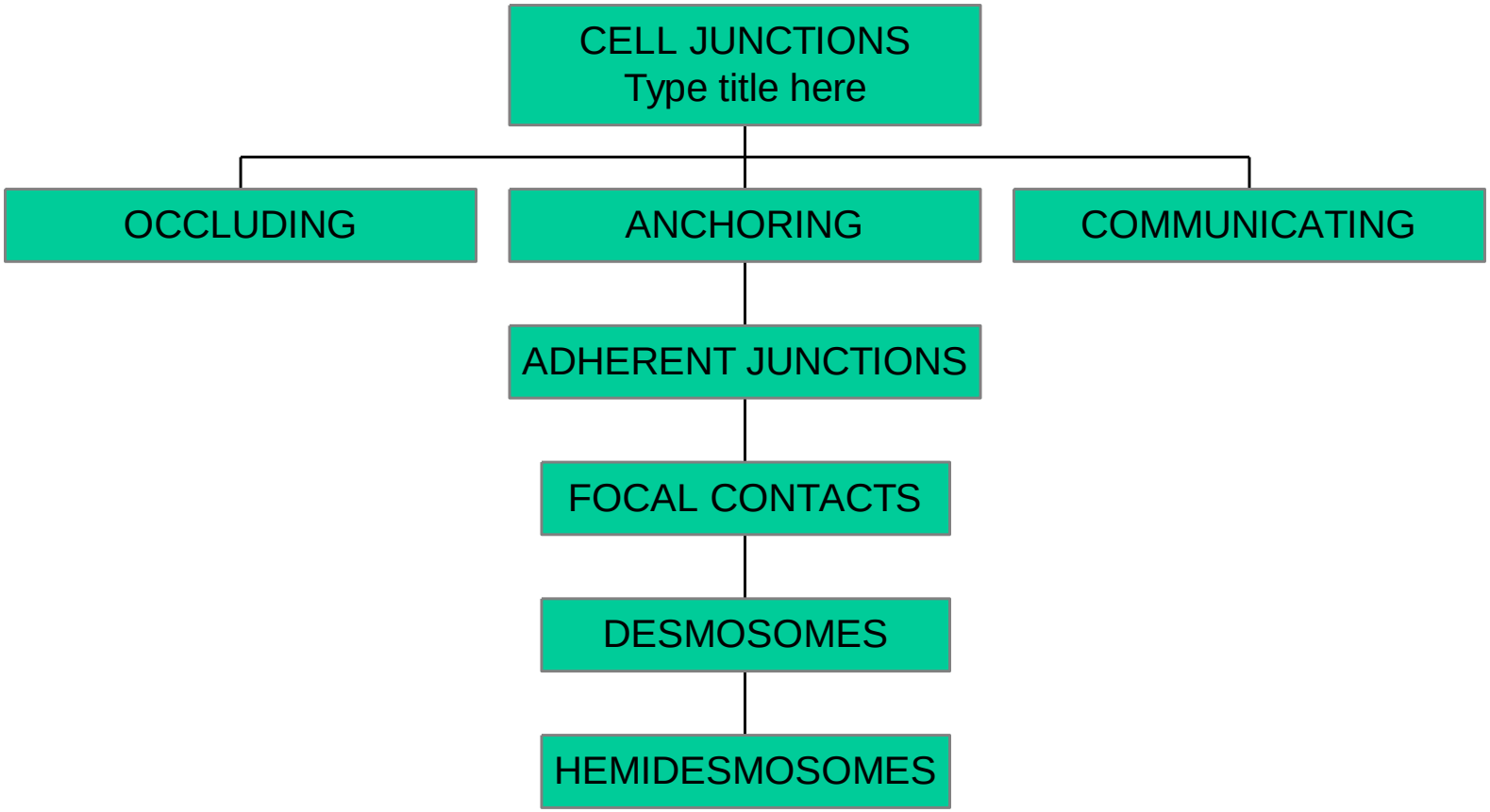
Keratinized stratified epithelium from the skin.

Note how the basal layers are folded forming papillae. These serve to attach the epithelium to the underlying tissues.

The mitotic figures; cells lost at the surface of both forms of stratified squamous epithelium are replaced by division of cells in the basal layers.

LO 4

Cell Adhesion



Cell junctions

Occluding:: Prevent diffusion of substances between adjacent cells

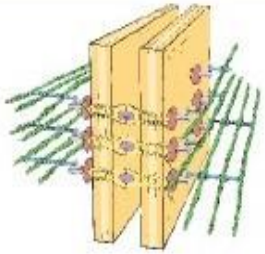
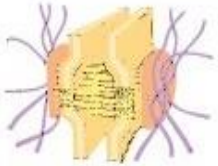
Adherent: Link actin filament network between adjacent cells

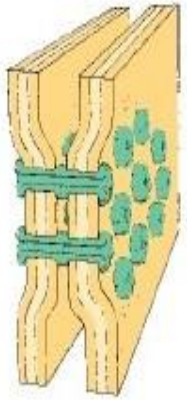
Focal contacts: Link actin filaments of a cell to extracellular matrix

Desmosomes: Link intermediate filament networks of adjacent cells

Hemidesmosomes: Connect intermediate filament network of a cell to the extracellular matrix

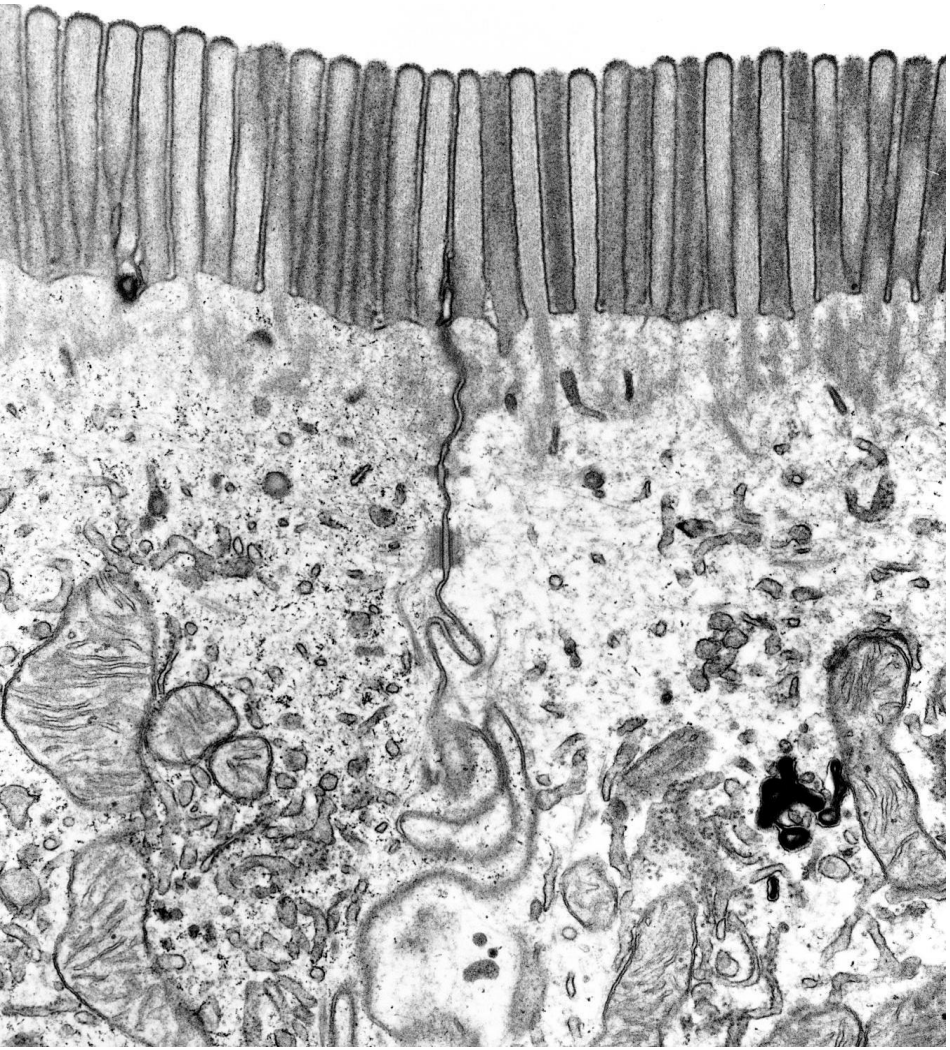
Communicating:
Allow selective diffusion of molecules between adjacent cells

	Classification		Major Link Proteins	Extracellular Ligands	Cytoskeleton Components	Intracellular Attachment Proteins	Functions
Occluding Junction (*cell-to-cell*)	Zonula occludens (tight junction)		Occludins, claudins, JAMs	Occludins, claudins, JAMs in adjacent cell	Actin filaments	ZO-1, ZO-2, ZO-3, AF6, cingulin symplectin ASIP/Povr 3 Rab 36, 13, 8 Sec 4, 6, 8	Seals adjacent cells together, controls passage of molecules between them (permeability), defines apical domain of plasma membrane, involved in cell signaling
Anchoring Junctions (*cell-to-cell*)	Zonula adherens		E-cadherin-catenin complex	E-cadherin-catenin complex in adjacent cell	Actin filaments	α-Actinin, vinculin	Couples the actin cytoskeleton to the plasma membrane at regions of cell-cell adhesion
	Macula adherens (desmosome)		Cadherins (e.g., desmogleins, desmocollins)	Desmogleins, desmocollins in adjacent cell	Intermediate filaments	Desmoplakins, plakoglobins	Couples the intermediate filaments to the plasma membrane at regions of cell-cell adhesion

Anchoring Junctions (*cell-to-extracellular matrix*)	Focal adhesion		Integrins	Extracellular matrix proteins (e.g., fibronectin)	Actin filaments	Vinculin, talin, α-actinin, paxillin	Anchors the actin cytoskeleton to the extracellular matrix, detects and transduces signals from outside the cell
	Hemidesmosome		Integrins ($\alpha_6\beta_4$ integrin), collagen XVII	Extracellular matrix protein (e.g., laminin-5, collagen-IV)	Intermediate filaments (possible microtubules and actin filaments via interaction with plectin)	Desmoplakin-like proteins, BP 230 plectin, erbin	Anchors the intermediate filaments to the extracellular matrix
Communicating Junction (*cell-to-cell*)	Gap junction (nexus)		Connexin	Connexin in adjacent cell	None	Not Known	Creates a conduct between two adjacent cells for passage of small ions and informational micromolecules

LO 4

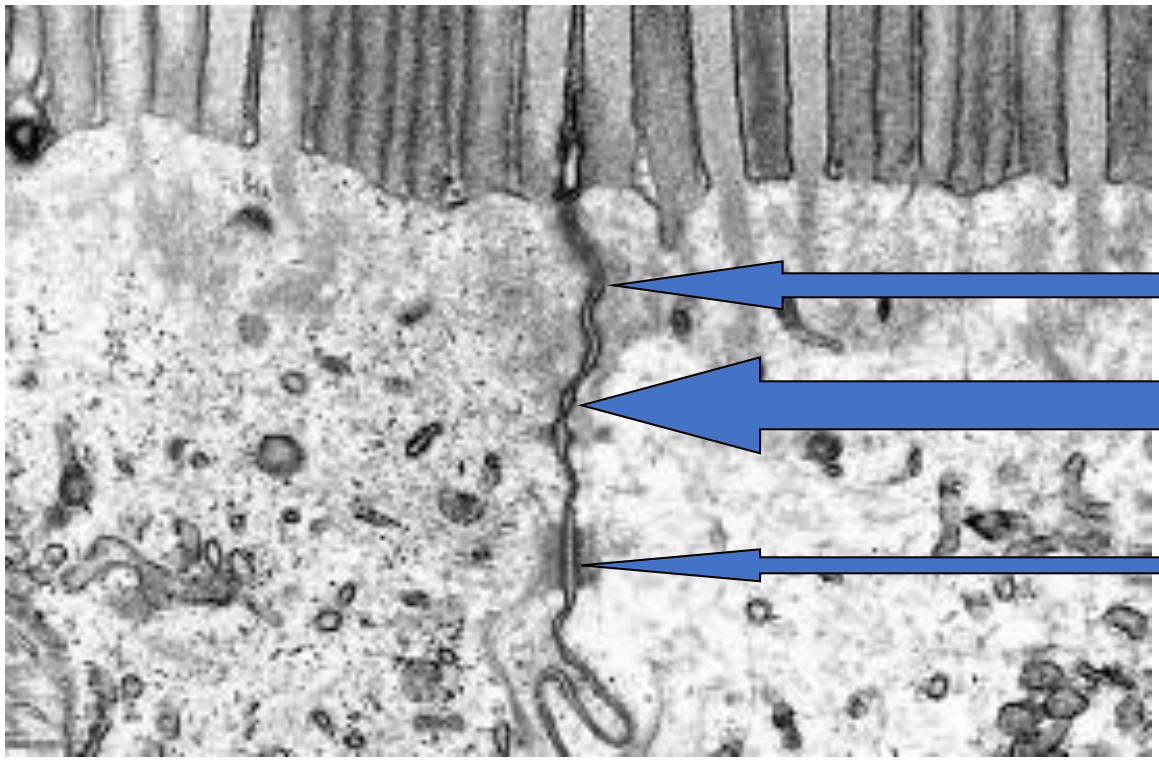
Junctional Complexes



- **The EM shows some of the cell / cell junctions found between epithelial cells.**

- **Where different junctions occur close together as between these two intestinal epithelial cells they are known as junctional complexes.**

LO 4



Thank you