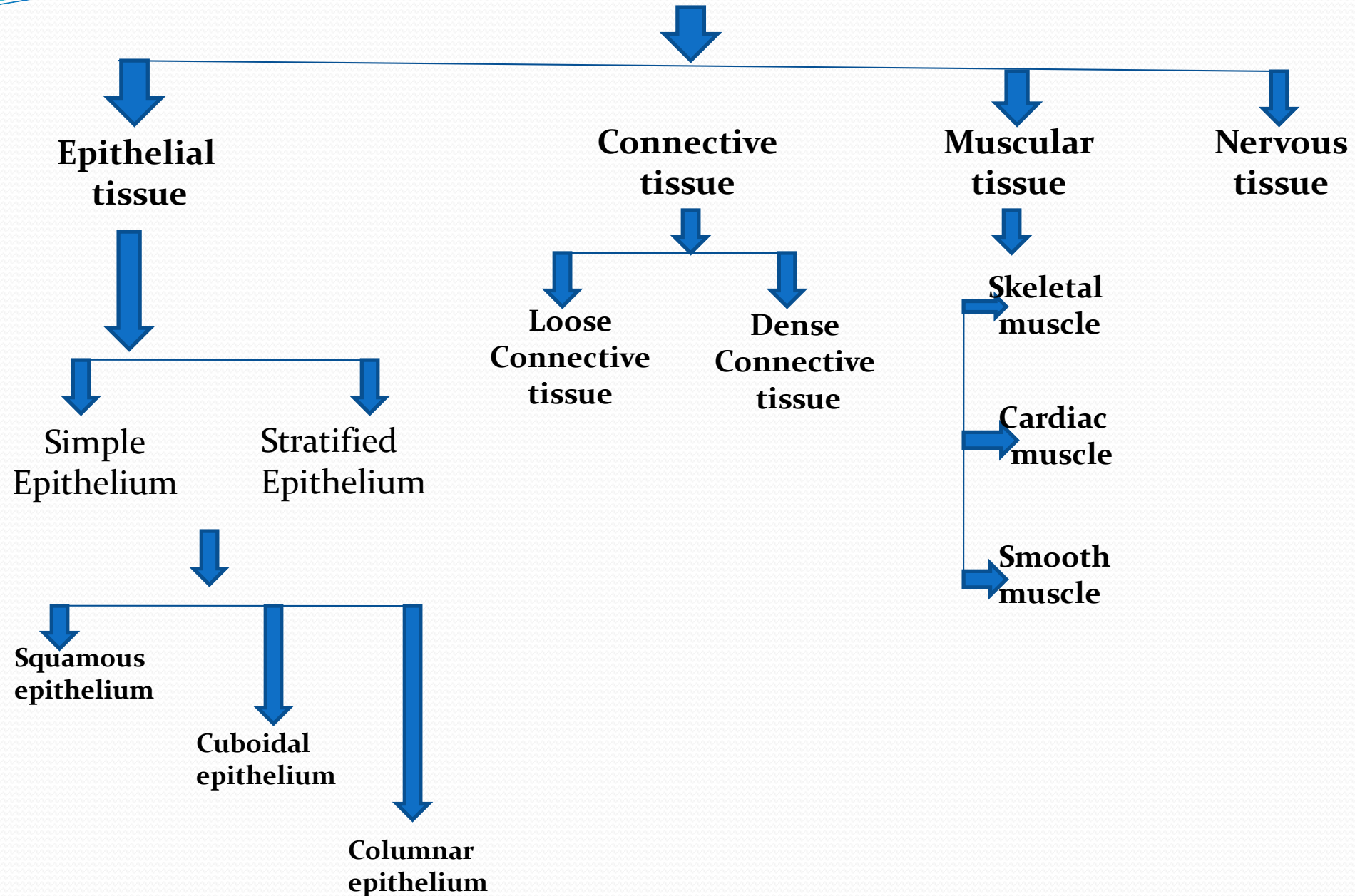


THE EPITHELIUM

By:
Najlaa Al-Mansour

2019-2020

Human Tissues



The Epithelium

Is the tissue that cover all free surface of the body, so it is sheets of the same type, closely packed cells and well attached to the basement membrane.

It have different functions according to their position in body system including:

1. Protection of external surface of the body (skin) .
2. Absorption & secretion of materials into and away from lumen or cavities (stomach and intestine).
3. Transport of substances by cilia(trachea).
4. Sensory reception as in gestation and olfaction (tongue and olfactory epithelium of nasal cavity).

Epithelium:

There are two basic types of epithelial tissues:

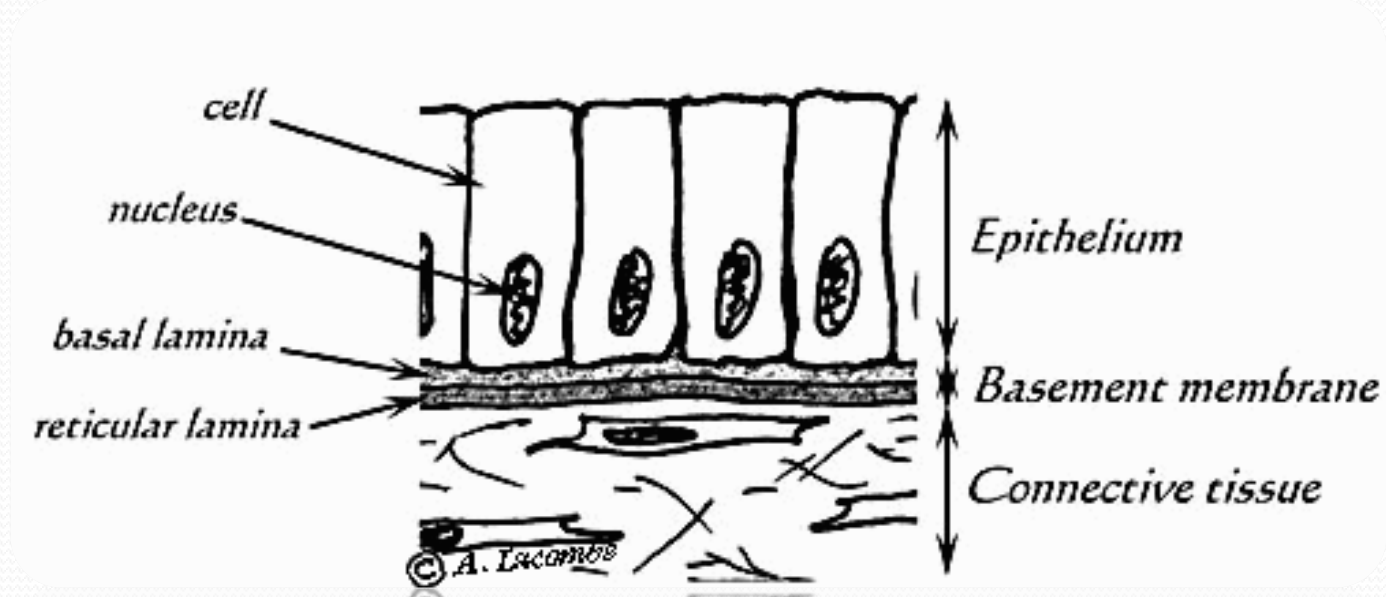
- **Covering and lining epithelia**
- **Glandular epithelia**

Lining epithelial cells form a continuous layer over all the free surfaces of the body:

- ❖ The outer layer of the skin.
- ❖ The inner surface of the digestive and respiratory cavities.
- ❖ The inner surface of the heart and blood vessels.
- ❖ The ducts of the exocrine glands.
- ❖ Glandular epithelia make up most of the glands in the body.

General Features:

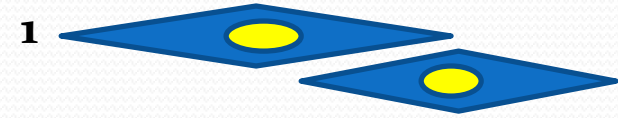
- Maximum cell-to-cell contact.
- Minimum extracellular material.
- Cell junctions: Several types of junctional specializations unite adjacent epithelial cells (tight junctions, desmosomes and gap junctions).
- Supported by basement membrane (basal lamella).
- Avascular: There are no blood vessels within the epithelial layer.
- Derived from all embryonic germ layers, including endoderm, mesoderm and ectoderm



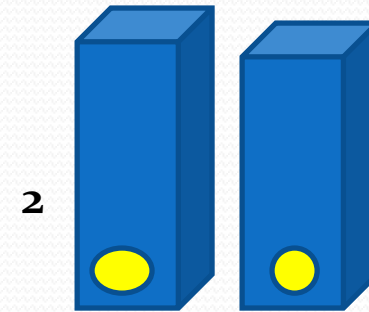
Classification

A. The epithelium classified according to the shape of cells into:

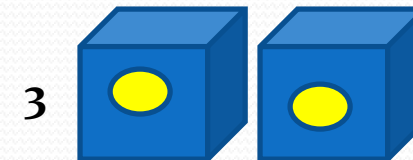
1. Squamous Epithelium



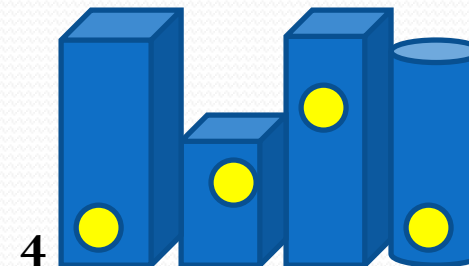
2. Columnar Epithelium



3. Cuboidal Epithelium



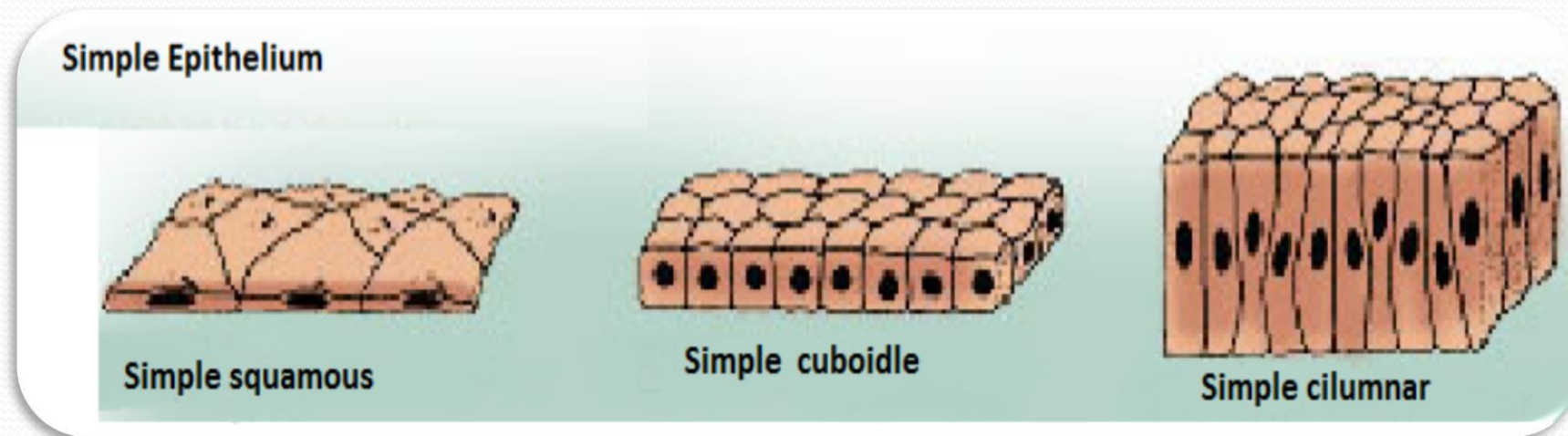
4. Pseudo stratified columnar Epithelium



B. According to the numbers of cells layers the epithelium classified into:

Simple: single layered epithelium.

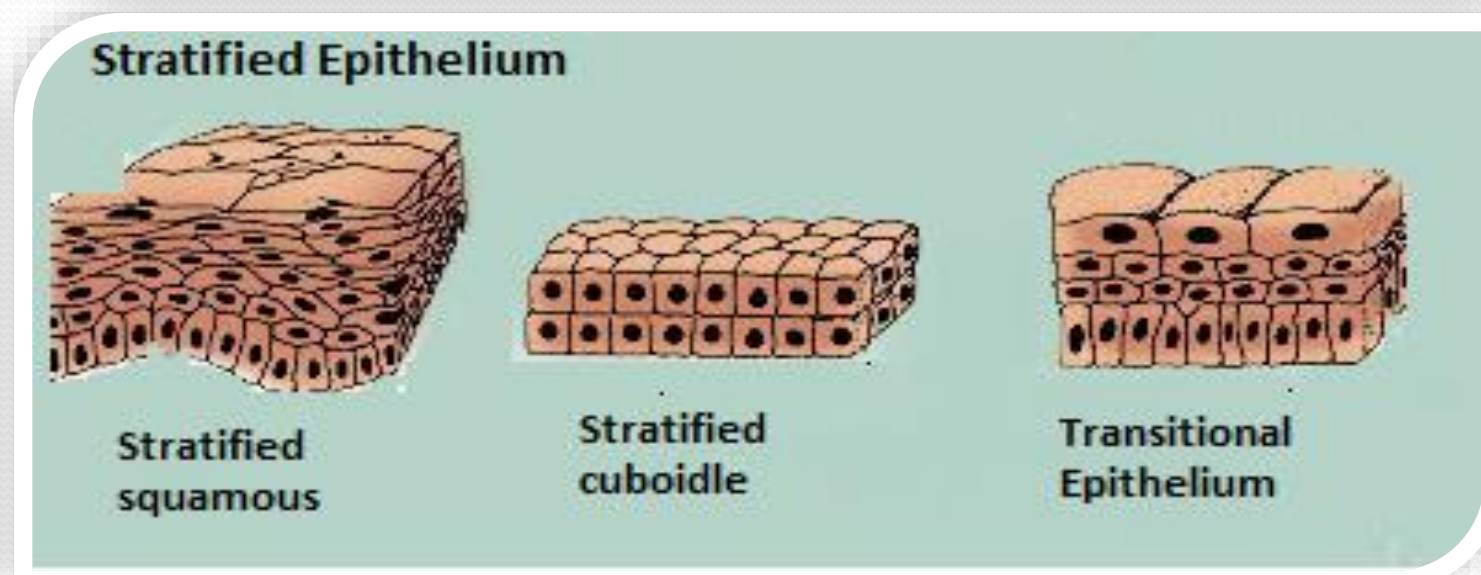
Being composed of one layer of cells only, they are very thin, their main function is to allow passage of substances between the lumen and the surrounding tissues



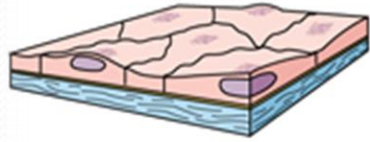
Stratified: epithelium with more than one layer

Being composed of several layers of cells, they are very thick. Their main function is to protect the tissues that they cover. The shape of the cells closest to the basement membrane is quite different from that of the cells at the top, near the lumen.

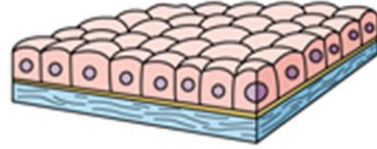
The stratified epithelia are further classified according to the shape of the cells at the free surface.



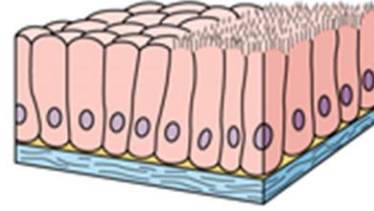
Simple



Squamous

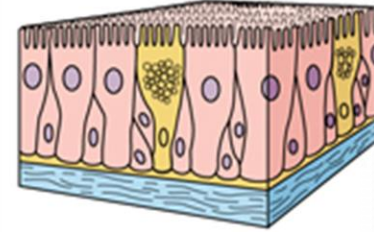


Cuboidal



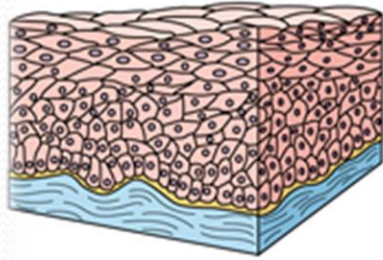
Columnar

Pseudostratified

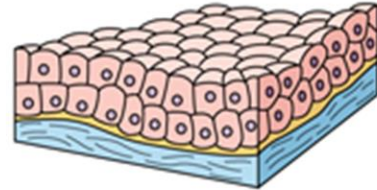


Pseudostratified columnar

Stratified

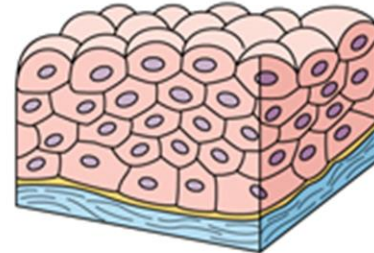


Squamous nonkeratinized

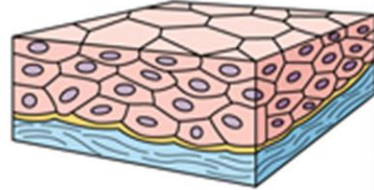


Cuboidal

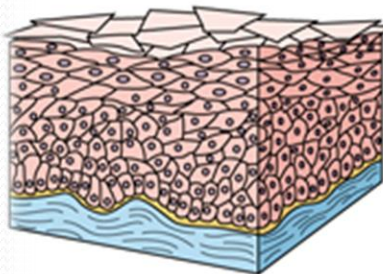
Transitional



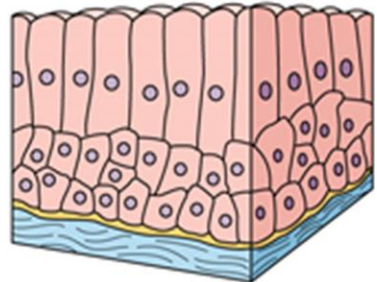
Transitional (relaxed)



Transitional (distended)



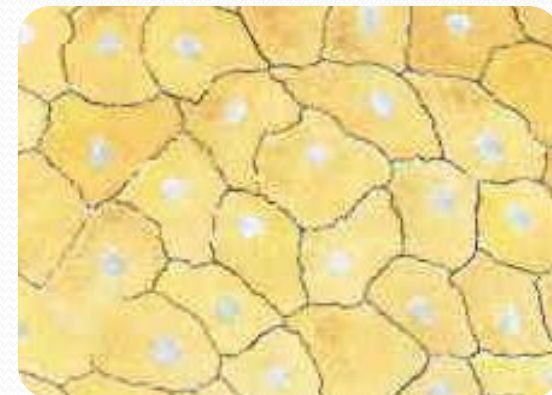
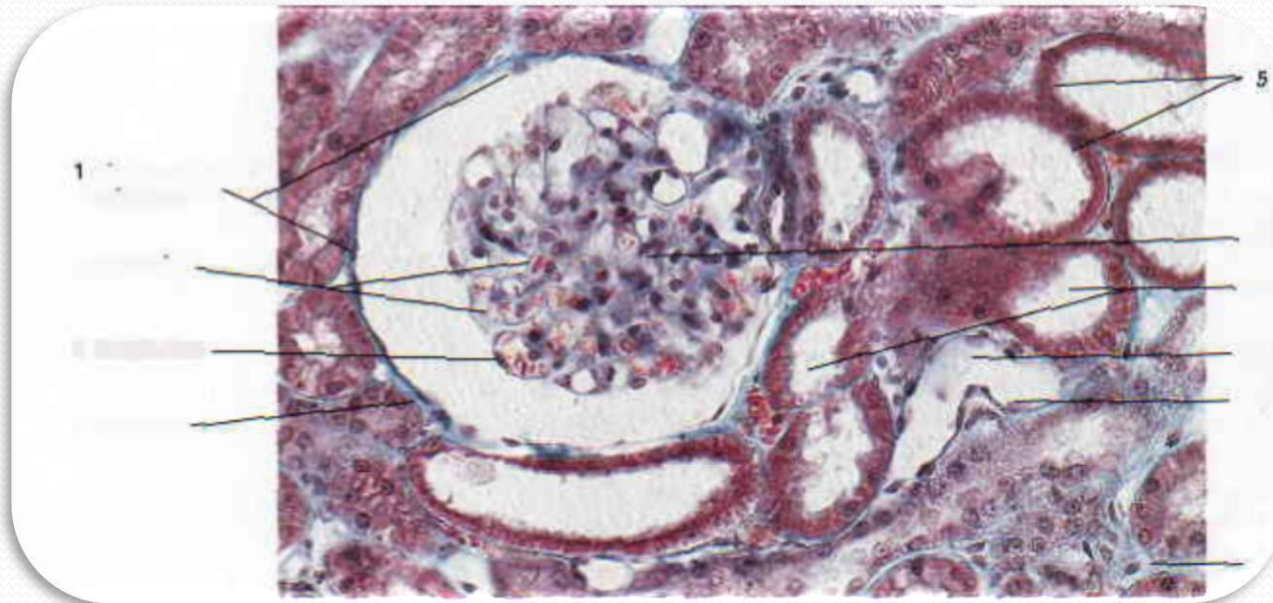
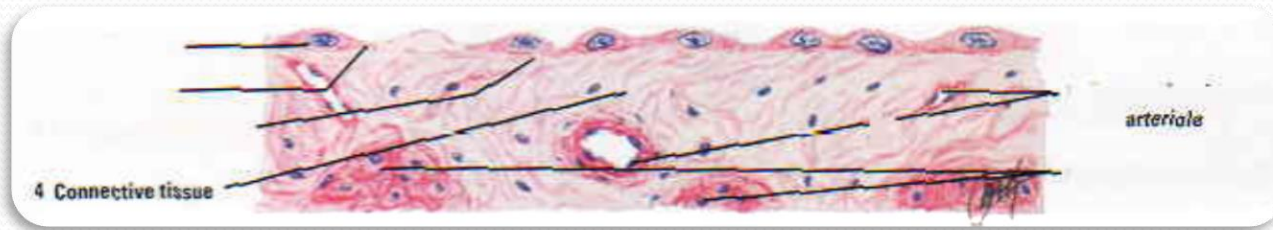
Keratinized



Columnar

Simple squamous epithelium:

This type characterized by its width of cells exceed the height , the nuclei are flat and parallel to the free surface. Lining the blood and lymphatic vessels , alveoli of lung, peritoneal cavity, loop of henle in kidney. Function: selective diffusion, absorption or secretion.

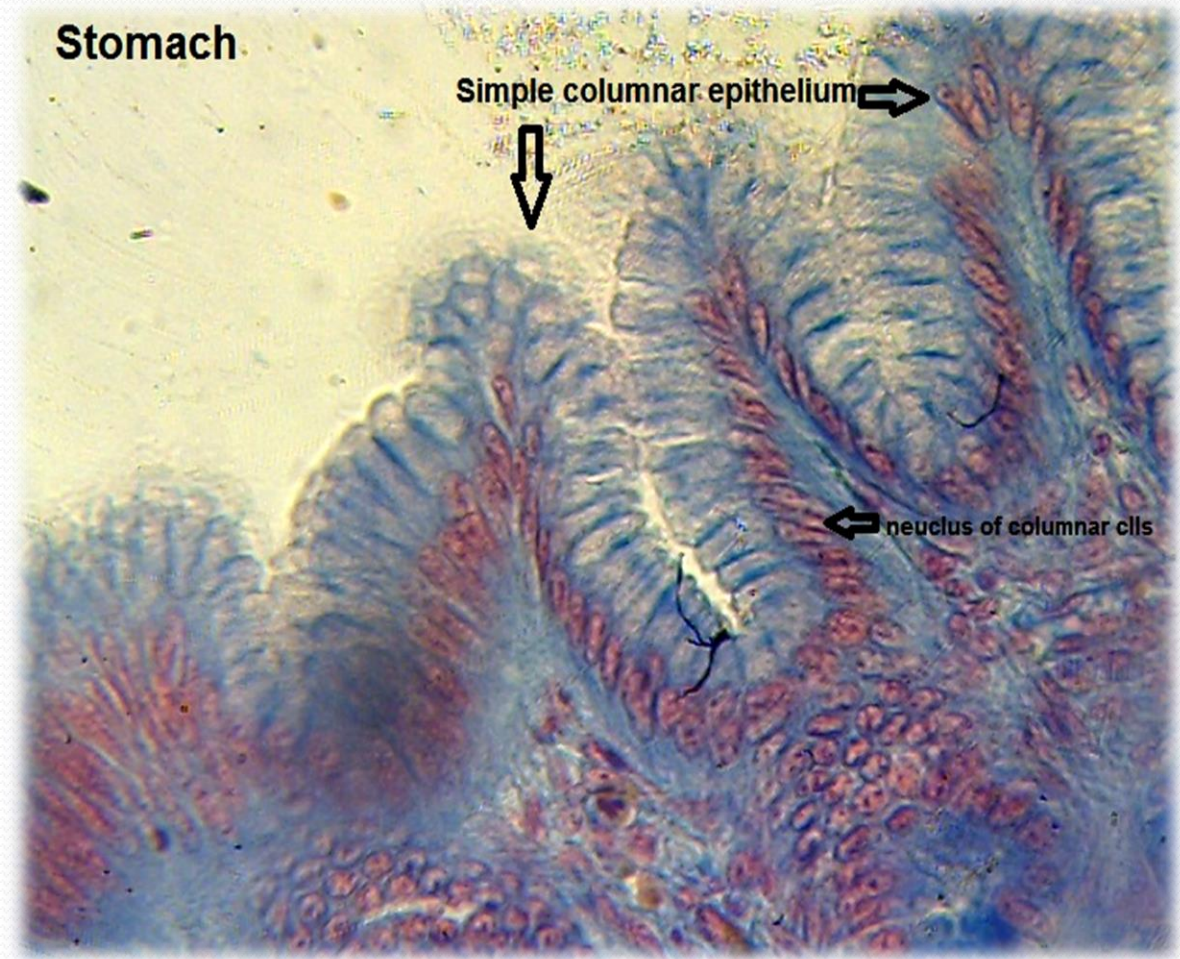


Simple columnar epithelium:

The type characterized by their height exceed the width and their nucleus basally situated

This type of epithelium always lining the mucosa of digestive system and the gentile system

Function
secretory surfaces (stomach);
lining gall bladder (absorbs water).

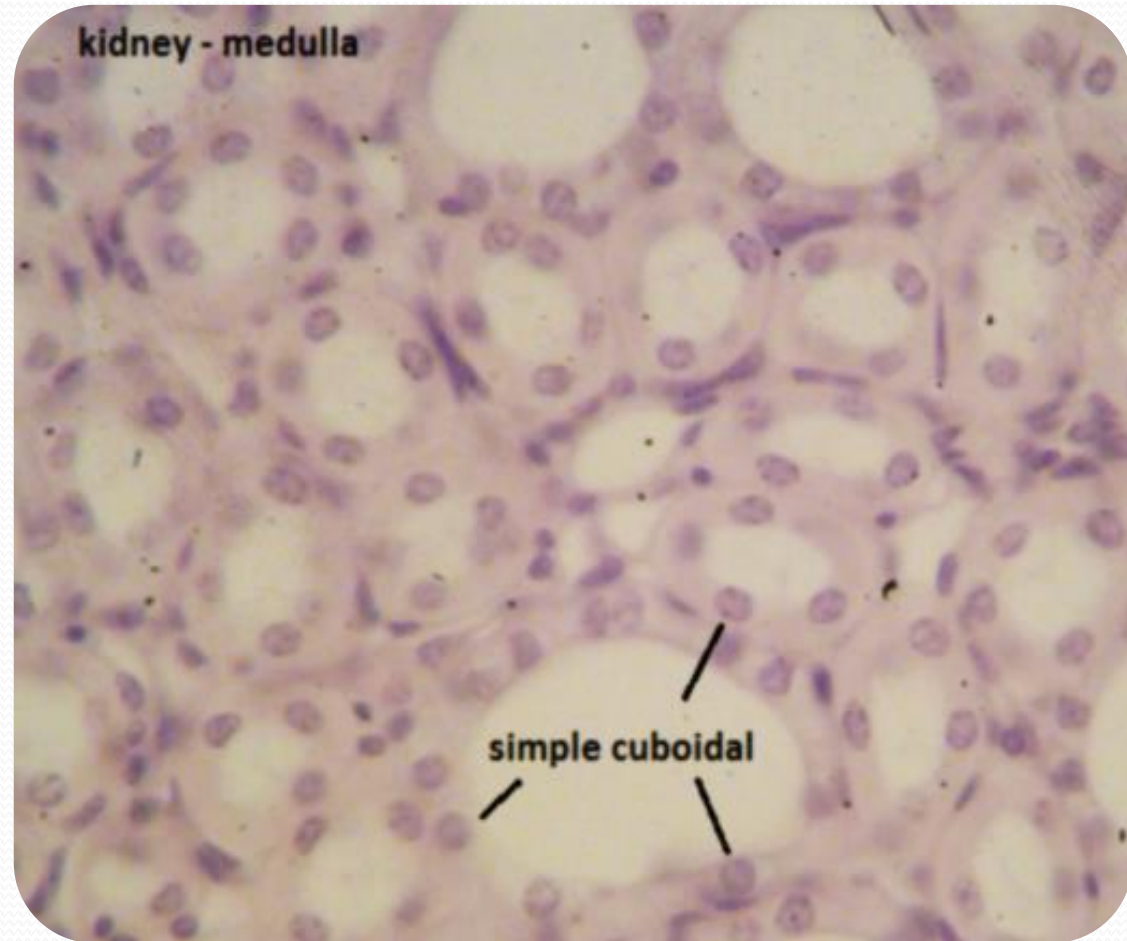


Simple cuboidal epithelium.

The type characterized by cubical shaped so their height and width are the same and their nucleus usually centrally situated

This type of epithelium always lining the renal tubule of kidney and the serous and mucus acini of glandular ducts

Function:
excretory, secretory or absorptive.



Pseudo stratified columnar:

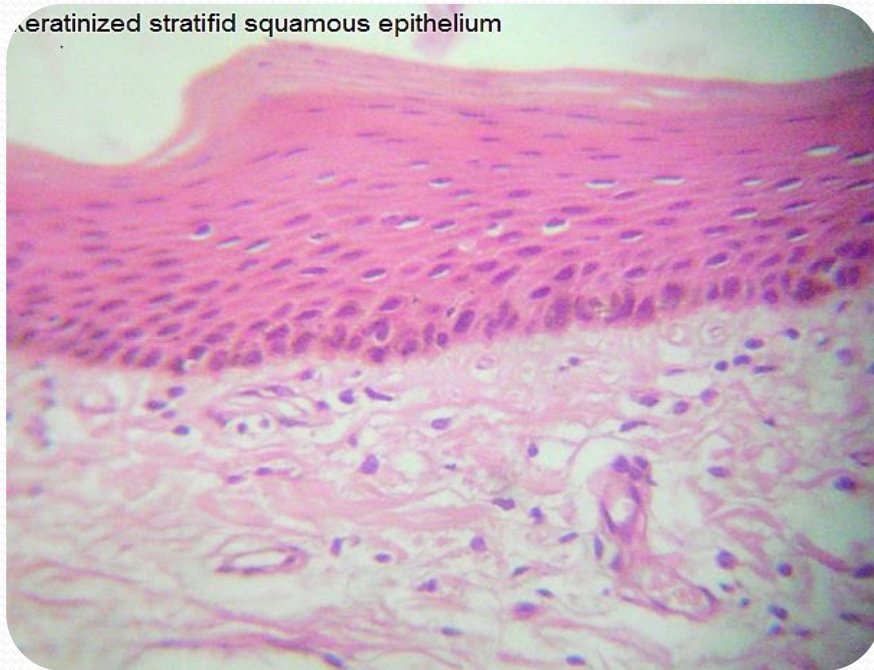
Characterized by irregular positioning of nuclei so it giving the impression of a multilayered tissue, all cells are attached to the basement membrane but some of them not reach to the luminal surface .

This type mostly found in trachea, bronchi, epididymus.

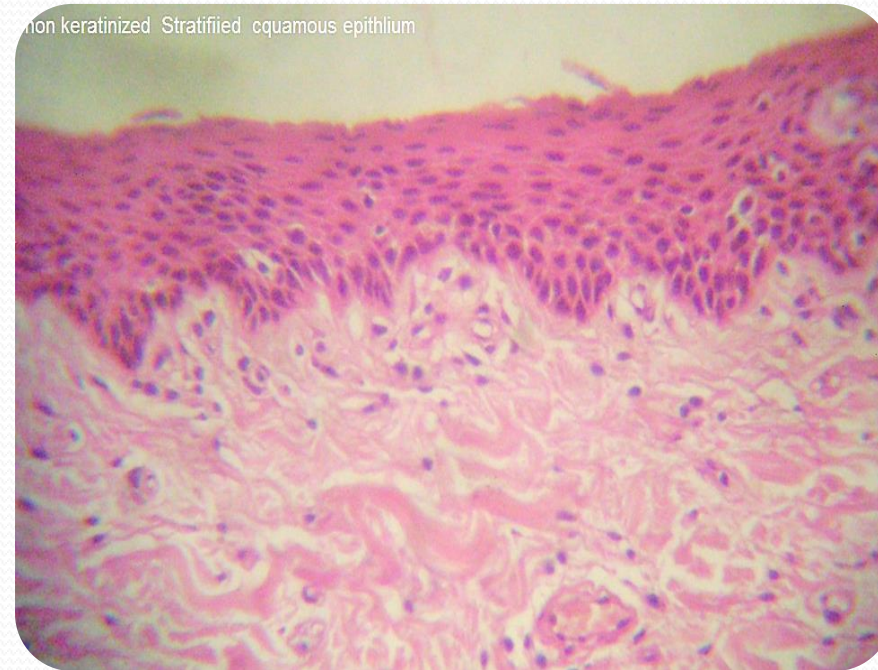


Stratified squamous epithelium

Is the more common type of multilayer epithelium, its found in the skin, esophagus, vagina, mouth cavity, cornea, conjunctiva and classified into keratinized and non keratinized

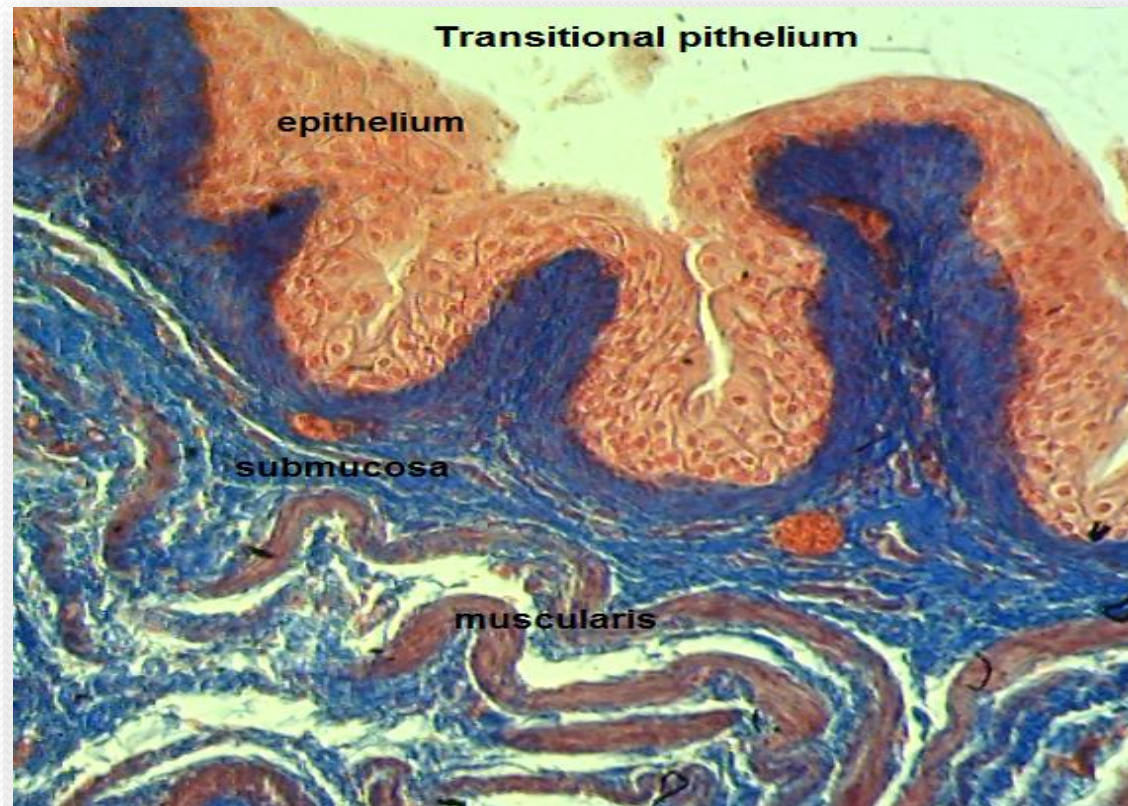


resists abrasion; moistened by glandular secretions. Present in oral cavity, pharynx, esophagus, anal canal, uterine cervix, and vagina.



Transitional epithelium

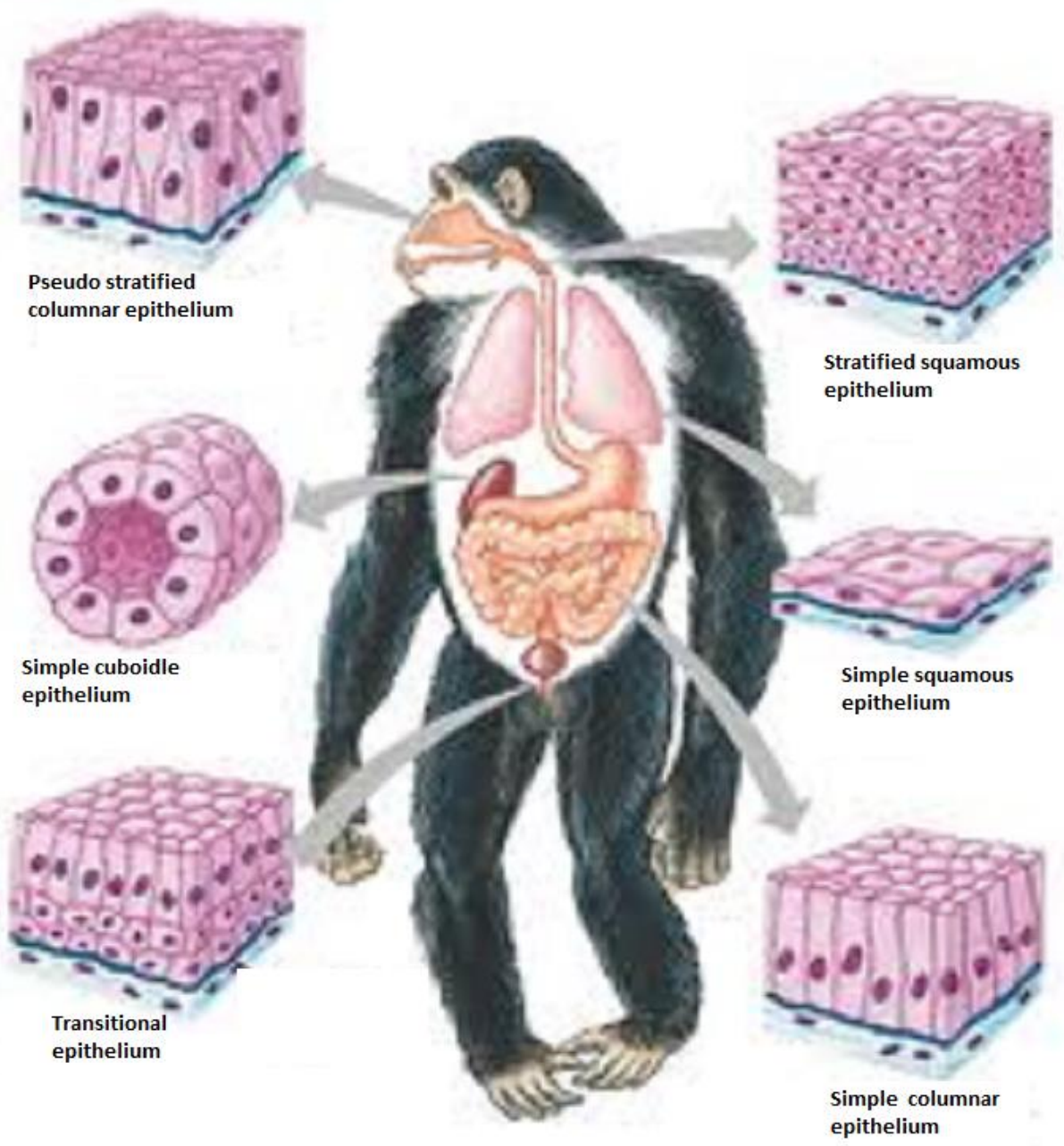
Found only in the urogenital system , it has an appearance that changes between stratified squamous and stratified cuboidal epithelium ,in relaxed state the apical surface cells are cuboidal in appearance but when stretched state the thickness greatly reduced and became flattened



Stratified cuboidal epithelium:

Lined the female urethra, and large ducts of salivary glands





Pseudo stratified columnar epithelium

Stratified squamous epithelium

Simple cuboidal epithelium

Simple squamous epithelium

Transitional epithelium

Simple columnar epithelium

Polarity and Cell-Surface Specializations

- ❖ Epithelial cell polarity and cell-surface specializations are related to cellular morphology and function.
- ❖ The apical domain, the region of the epithelial cell facing the lumen (the free surface of the epithelial cells), is rich in ion channels, carrier proteins, H⁺-ATPase, glycoproteins, and hydrolytic enzymes. as well as **aquaporins**, channel-forming proteins that function in regulation of water balance. It also is the site where regulated secretory products are delivered for release.

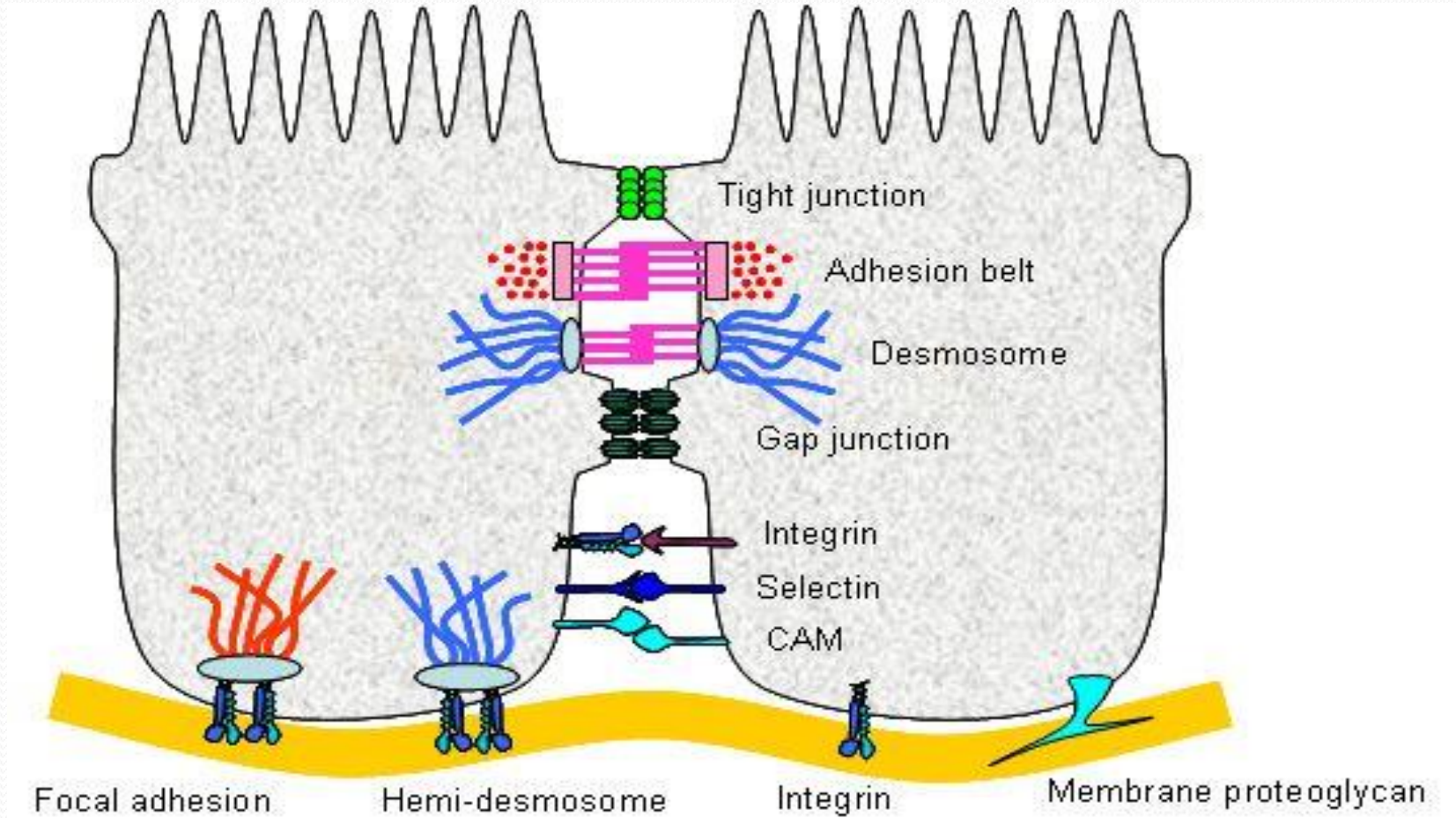
Microvilli

- ❖ *are small finger-like cytoplasmic projections emanating from the free surface of the cell into the lumen.*
- ❖ When observed by electron microscopy, absorptive columnar (and cuboidal) epithelial cells exhibit closely packed microvilli, which are cylindrical, membrane-bound projections of the cytoplasm emanating from the apical (luminal) surface of these cells.
- ❖ Microvilli represent the **striated border** of the intestinal absorptive cells and the **brush border** of the kidney proximal tubule cells observed by light microscopy.

Cilia

- ❖ Cilia are long motile, hair-like projections (diameter, $0.2\ \mu\text{m}$; length, 7 to $10\ \mu\text{m}$) that emanate from the surface of certain epithelial cells. In the ciliated epithelia of the respiratory system (e.g., trachea and bronchi) and in the oviduct, there may be hundreds of cilia in orderly arrays on the luminal surface of the cells.
- ❖ Other epithelial cells, such as the hair cells of the vestibular apparatus in the inner ear, possess only a single cilium, which functions in a sensory mechanism.
- ❖ Stereocilia: found in epididymis, not a true cilia, non-motile, long anastomosing microvilli.
- ❖ Flagella: only present in spermatozoa in humans similar to cilia but much longer, only 1 flagellum per sperm cell.

Cells Lateral specialization



Cells Lateral specialization

- ❖ **Tight junctions:** appear as a branching network of sealing strands that provide a physical intercellular barrier that restricts paracellular transport.
- ❖ **Gap junctions:** are unique cell-to-cell channels that allow diffusion of small metabolites, second messengers, ions and other molecules between neighboring cells.
- ❖ **Desmosomes:** are adherent points that form a continuum of cells within tissues by linkage of their integral membrane proteins .