

# HISTOLOGY SHEET

Doctor 2021 -mercy- | medicine | MU

## DONE BY:

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## DOCTOR

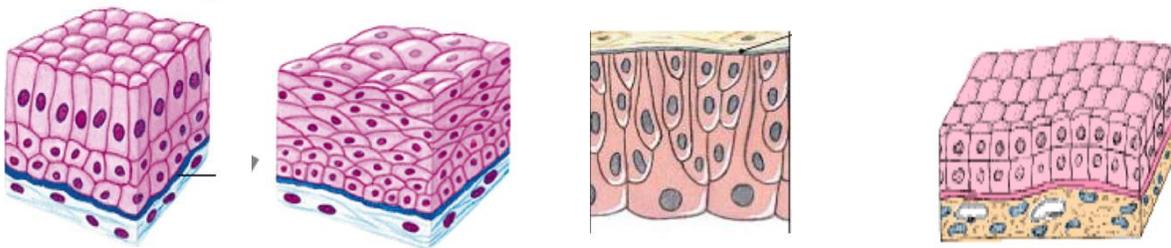
Dr. ferdous star

Type	Site	Function
<b>Simple Squamous</b>	<ul style="list-style-type: none"> <li>• Bowman's capsule- kidney</li> <li>• Lung alveoli</li> </ul>	Filteration
<b>Simple cuboidal</b>	<ul style="list-style-type: none"> <li>❖ Thyroid follicles</li> <li>❖ Kidney tubules</li> </ul>	<ul style="list-style-type: none"> <li>❖ Secretion</li> <li>❖ Ions exchange</li> </ul>
<b>Simple Columnar non ciliated</b>	<ul style="list-style-type: none"> <li>➢ Digestive tube</li> <li>➢ Ducts of the glands</li> </ul>	<ul style="list-style-type: none"> <li>➢ Absorption</li> <li>➢ Secretion</li> </ul>
<b>Simple Columnar ciliated</b>	<ul style="list-style-type: none"> <li>▪ uterus, oviduct</li> <li>▪ bronchiole of the lung</li> </ul>	<ul style="list-style-type: none"> <li>▪ Movement of luminal contents</li> </ul>
<b>Pseudostratified columnar ciliated</b>	<ul style="list-style-type: none"> <li>✓ Nose- Trachea</li> <li>Just we found it on respiratory system , so we called it "respiratory epithelium"</li> </ul>	Movement of luminal contents
<b>Pseudostratified columnar non ciliated</b>	<ul style="list-style-type: none"> <li>❑ Male genital tract</li> <li>❑ large ducts of glands</li> </ul>	Secretion

## 2- Stratified Epithelium

...We can classify the simple epithelium by the shape of the cell, but stratified epithelium is classified according to the superficial layer.

...The main function of stratified epithelium is protection.



**What cell is on the top layer?**

-Classification according to shape of most superficial layer

-Stratified squamous epithelium

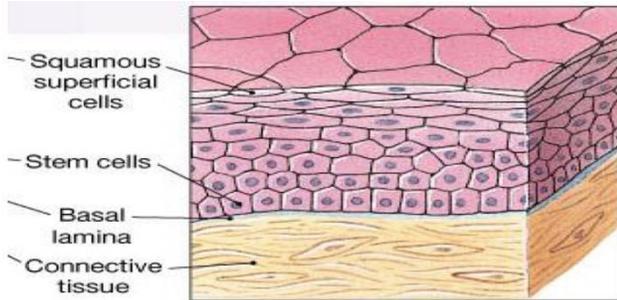
-Stratified cuboidal epithelium

-Stratified columnar epithelium

-Transitional epithelium

## Stratified Squamous Epithelium

A distinction must be made between Uterus and fallopian tube both columnar ciliated epithelium While vagina is non keratinized stratified squamous.



...Note: Anal canal non keratinized But the lower end (anus فتحة الشرج ) which opens outward is keratinized

All the epithelium tissue we must know the: the sites where it is located and the function

### Stratified squamous epithelium(keratinized &Non keratinized)

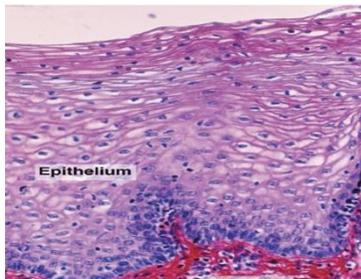
(Physical protection)

...Best example the epithelium for protection is? Keratinized stratified squamous of epithelium

... keratin layer is utilized (تستخدم) for higher protection requirements.

### Non-Keratinized

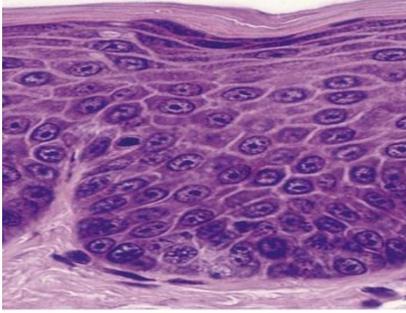
... it is found in cornea to reduce friction that results from blinking (رمش العين)



...The epithelium here it must be dense and bear

...Non keratinized: oral cavity (the sides and the floor of the oral cavity), anal canal , vagina , esophagus.

## Keratinized {skin}



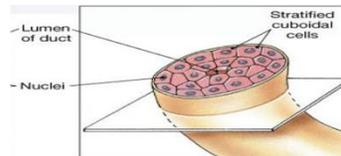
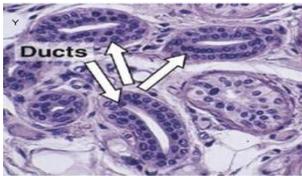
... He has no other place and any place open on the skin like eye cavity, mouth cavity and anal canal be keratinized

...the first Layer there has no nuclei and it looks like the fiber which is keratin

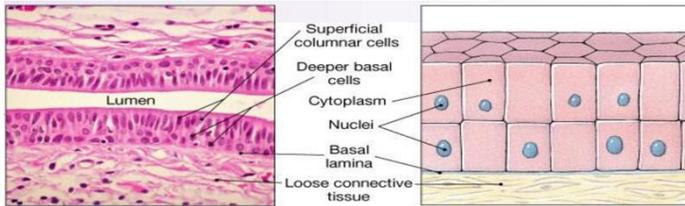
...Not all layer there is nucleated

## Stratified Cuboidal Epithelium

(Ducts of sweat glands: secretion) (Rare)



## Stratified Columnar Epithelium (Rare)



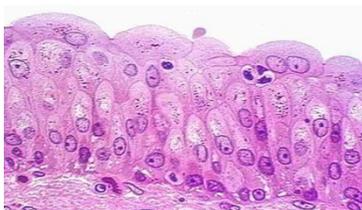
- ciliated: penile, urethra

- Non ciliated: conjunctival fornix

(protection)

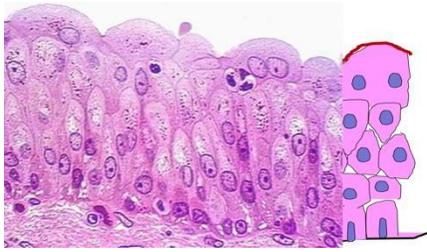
The internal surface of the eyelid (جفن العين) is pink, which is the conjunctival fornix that covers the whole eye. It is considered as non-ciliated stratified columnar epithelium.

Urethra in males is longer than that in females.



**transitional epithelium** has no place but in urinary system, It has another name because it is confined to the urinary system : *urothelium*  
Most common sites Ureters (الحالبان) and kidney pelvis (خصر الكلية) and urinary bladder.

(Urinary bladder - empty).

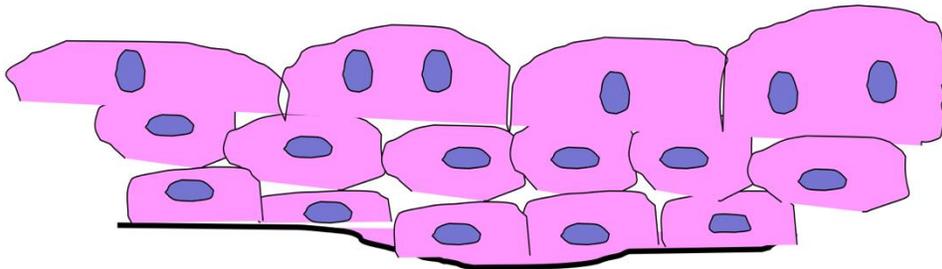


To resist urine toxicity, these cells cover their apical surface with a thick membrane called cuticular border. Each Dome shaped cell has a 1 or 2 nuclei. A cell that has a dome on top and large cuboidal epithelium up to 10 layers. Several layers of polyhedral It is round, but it

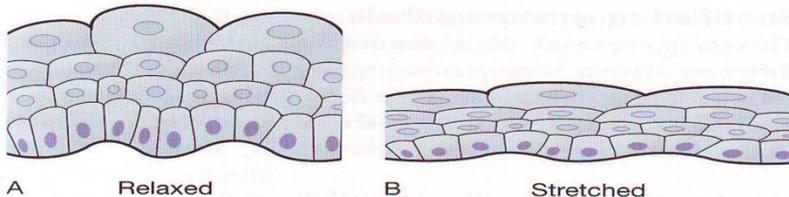
**Empty urinary bladder.** has a curved side on the side (Cuboidal or (Colomunar).

### Full urinary bladder

The transition epithelium consists from 10 layers but in full urinary bladder state it becomes from 2-3 layers that because the another layers stretched



### Transitional epithelium



Transitional epithelium: A. Relaxed. B. Stretched.

### Adaptation of Transitional epithelium to its function:

(Its function is reservewor)

- Thin corrugated basement membrane
- Abundant mucoid intercellular substance to allow gliding of cells on each other. Unlike the stratified squamous that is no intercellular neither on keratinized stratified nor non keratinized stratified

- Cuticular border at the free surface. **make thickening membrane .**

Type of epithelium	Site	Function
<b>Stratified squamous Non Keratinized</b>	<input type="checkbox"/> Oesophagus- vagina	Physical protection
<b>Stratified squamous Keratinized</b>	<input type="checkbox"/> skin	Physical protection
<b>Stratified cuboidal</b>	<input type="checkbox"/> <b>Ducts of sweat glands</b>	<b>secretion (rare)</b>
<b>Stratified Columnar</b>	<input type="checkbox"/> - ciliated: penile urethra <input type="checkbox"/> - Non ciliated: conjunctival fornix	<b>Protection (rare )</b>
<b>Transitional</b>	<input type="checkbox"/> urinary bladder	<b>protection</b>

## Glandular Epithelium

Its function is secretion not covering. .

Origin.

differentiation

... If the cells make communication with surface we called it "exocrine gland "

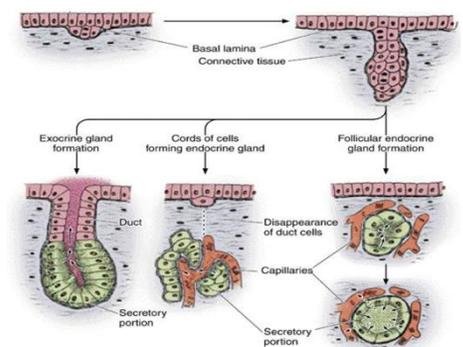
...The best example of mexocrine gland is pancreas : part endocrine , part exocrine , so we called it mexocrine

...The epithelium tissue makes invagination to underlying connective tissue, then works proliferation and secrets secretion

## Types of glandular epithelium

It is classified according to:

- 1- Number of **cells** (Not layer )
- 2- Presence or absence of a duct system
- 3- Mode of secretion (mechanism)
- 4- Nature of secretion
- 5- Shape of the secretory portion(The shape of portion that makes secretion we call it secretory unit)



## 6- Branching of duct

### Number of cells

**Unicellular.**

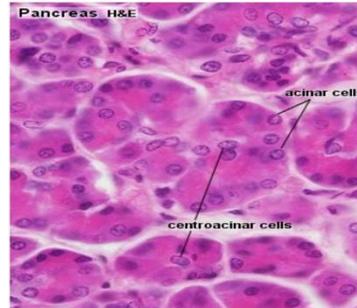
**(Goblet cell)**

It's exocrine gland and secret  
a mucous secretion



**Multicellular**

**(Most of the glands e.g. Salivary glands)**



### Mechanism (Mode) of Glandular secretions

**Merocrine glands**

The secretion released through exocytosis e.g. **Pancreas**



**Apocrine glands**

The secretion involves the loss of both product and apical cytoplasm (Occurs  
shedding to apical part) e.g. **Mammary gland.**



**Holocrine gland**

The secretion destroys the cell

e.g. **Sebaceous glands**

**Presence of a duct system**

**Exocrine.**

**Endocrine.**

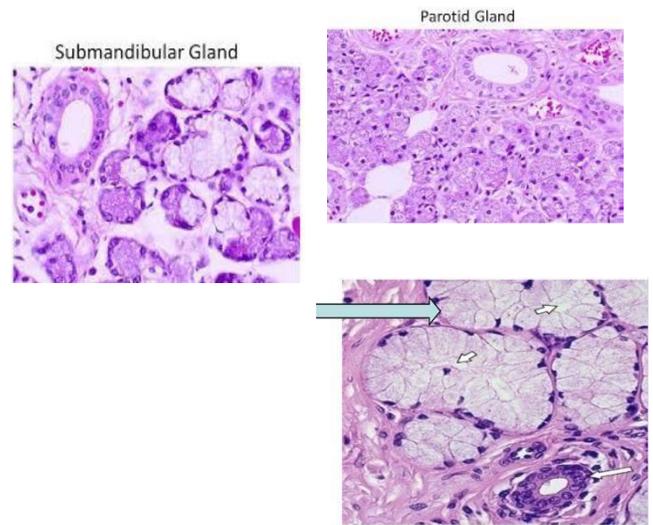
**Mixed**

Exocrine Glands			Endocrine Glands
Merocrine	Apocrine	Holocrine	

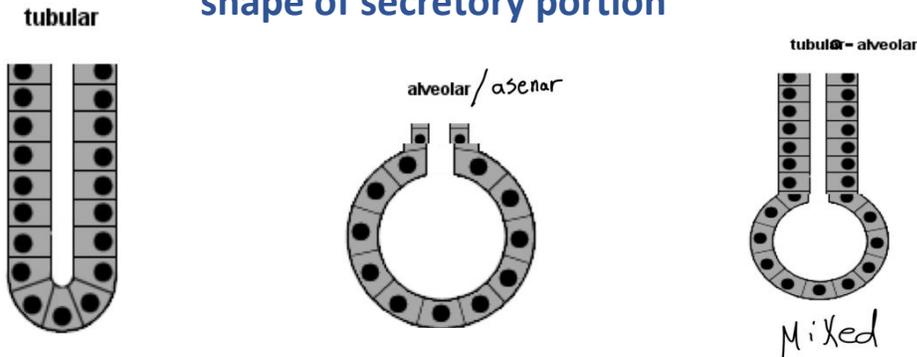
salivary glands are divided into minor salivary glands and 3 pairs of major salivary glands: submandibular, sublingual and parotid gland

**Nature of Glandular secretions**

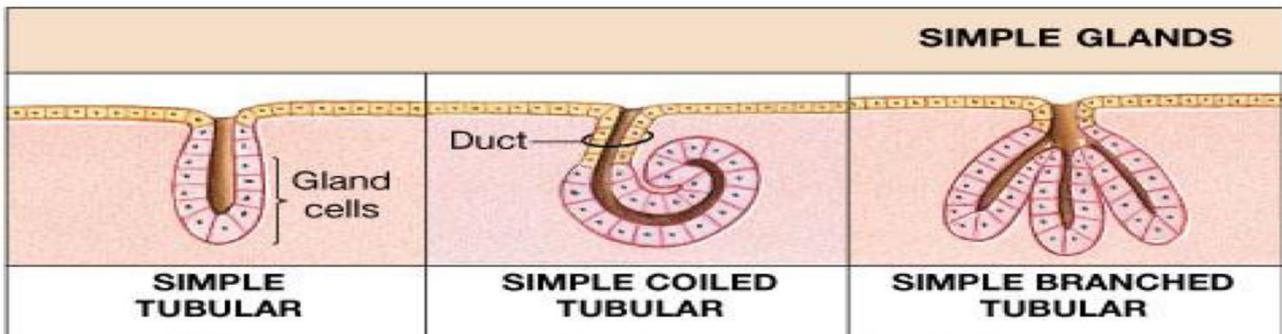
- Serous glands: parotid gland
- Mucous glands: sublingual gland
- Mixed glands: submandibular gland
- Glands with special secretion: sebaceous gland (oily secretion)  
lacrimal gland watery secretion  
Mammary gland : Milk secretion  
Glands in the ear : wax(In external ear)



**shape of secretory portion**



**Classification of Tubular Glands**



One duct with one secretory

One duct with branched secretory

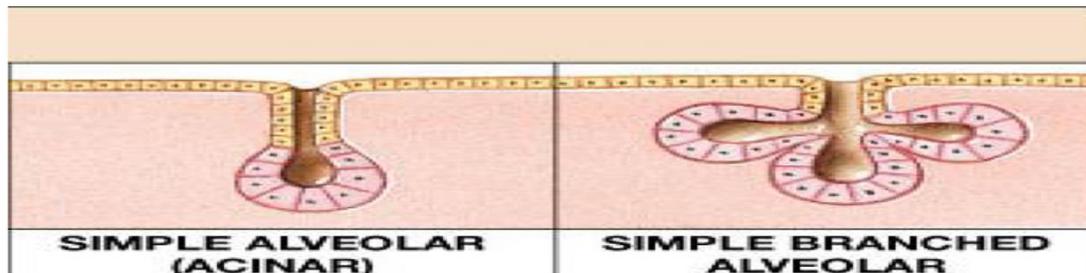
**Intestinal glands.**

**Sweat glands.**

**Fundic glands**

**Fundic glands** It's part of stomach because stomach consists from three parts: fundic , body and pylorus

## Classification of Alveolar Glands



### Sebaceous glands.

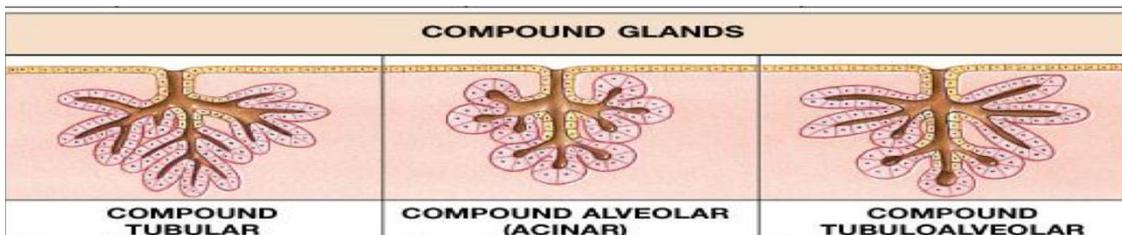
It is always related with hair follicle on the skin.

### Tarsal glands

It's modified sebaceous gland that doesn't related with hair follicle it found on eyelid

## Classification of Compound Glands

**Compound:** branched duct, branched secretory portion



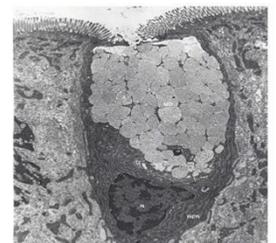
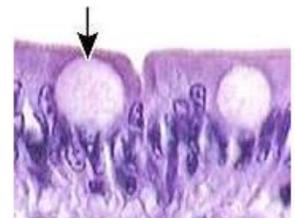
Liver

mammary glands

salivary glands

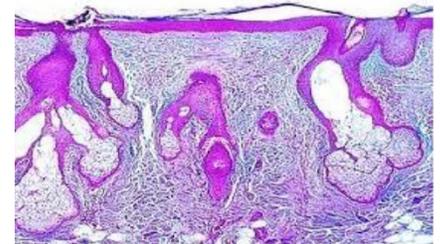
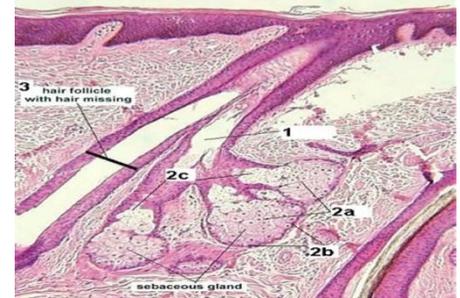
## Goblet cells

- Unicellular
- Exocrine
- Shape of the cell : flask shape with basal nuclei (The upper part "destinded" is filled by mucous secretion)
- **Mode** of secretion: Merocrine
- **Nature** of secretion : Mucus
- **Site** : Respiratory system (Makes trappings for dust particle that the ciliated epithelium didn't catch it) , GIT( Goblet cell + simple columnar )



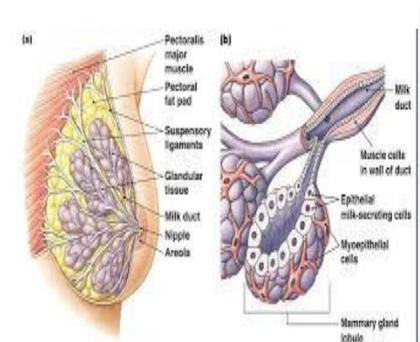
## Sebaceous gland

- Exocrine
  - Mode : Holocrine
  - Nature : (oily secretion)
  - Shape of secretory units : Branched alveolar  
Simple branched alveolar : tarsal modified  
Simple alveolar : sebaceous gland
  - Site : Related to hair follicles
  - Activity of the gland increase at the age of puberty
  - Obstruction of the duct by thick secretion & keratin → Acne (Acne : is the pathology of sebaceous gland)
- The epithelium tissue that's on skin we called it epiderm and the connective tissue that's under it we called it derm



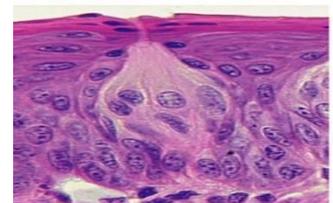
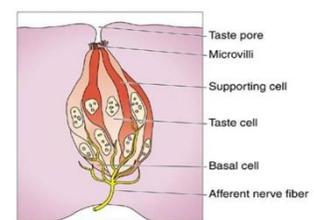
## Mammary gland

- Exocrine
- Mode : Apocrine
- Nature : (milk secretion [Special type])
- Shape of secretory units : Compound alveolar
- Site : Related to skin (In vectorial region)

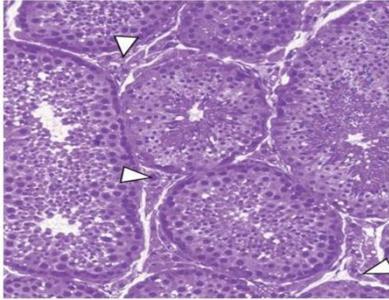


## Special types of epithelium

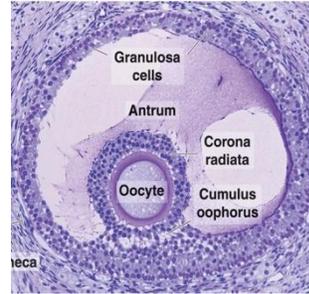
- 1-Neuroepithelium
  - E.g. Taste buds
  - Site : dorsal surface of the tongue (other sites: 2- olfactory mucosa : that found in nose. , 3- visual : that found in retina)  
{ 1+2+3 special sense organ }
  - Are epithelial cells in nature, but with neural functions.
  - Function : sensation
- ### Special types of epithelium
- #### 2. Germinal epithelium



**Testis: sperm.**



**Ovary: ovum**



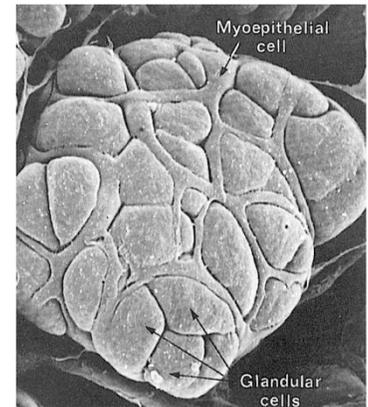
**Function: Reproduction**

### 3- Myoepithelium

**Shape :** Irregular with many processes,  
Contain actin & myosin in the cytoplasm

**Site :** Acini & ducts of the gland

**Function :** Contraction for squeezing the secretion



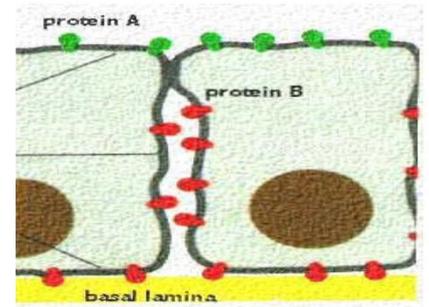
### Functions of epithelium

- **Protection**, protect underlying tissues from mechanical injury, harmful chemicals invading bacteria and from excessive loss of water.
- **Absorption**: certain epithelial cells lining the intestine absorb nutrients from the digestion of
- **Secretion**, in glands, epithelial tissue is specialised to secrete specific chemical substances such as enzymes, hormones and lubricating fluids.
- **Excretion**, epithelial tissues in the kidney excrete waste products from the body and reabsorb needed materials from the urine. Sweat is also excreted from the body by epithelial cells in the sweat glands.
- **Sensation**: sensory stimuli are detected by specialized epithelial cells; specialized epithelial tissue containing sensory nerve endings is found in the skin, eyes, ears and nose and on the tongue.
- **Diffusion**, simple epithelium promotes the diffusion of gases, liquids and nutrients; because they form such a thin lining, they are ideal for the diffusion of gases (e.g. walls of capillaries and lungs).
- **Contraction** e.g., myoepithelial cells have ability to contract.

- **Cleaning:** ciliated epithelium assists in removing dust particles and foreign bodies which have entered the air passages.

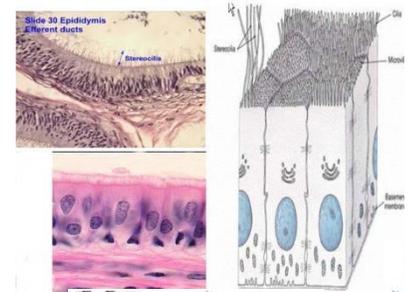
## Epithelial polarity

- ❖ Cells have a top , lateral side and a bottom
- ❖ So different activities take place at different places
- ❖ **Apical modifications**
- ❖ **Basal modifications**
- ❖ **Lateral modifications**



## Apical modifications

- **Cilia** Has: 1- base , 2-exoshaft
- **Microvilli** Inside its core has the actin filament
- **Stereocilia**



**stereocilia** are long as cilia and nonmotile as microvilli, it is found in male genital tract.

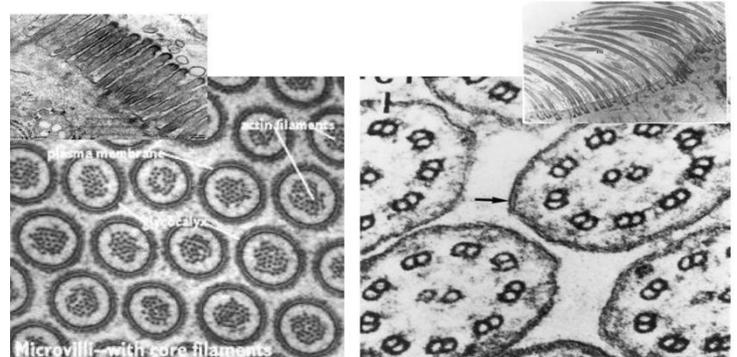
## Apical modifications

**Microvilli** : short, numerous, nonmotile (غير متحرك)

**Cilia**: long, motile

...In core of cilia microtubules because it comes from centriole

... Centriole is in origin microtubules arranged as 27 microtubules (9) triplet shaft each one has three shaft then when it becomes modification these 9 groups become double not triple and in the center I have two central singlct \*\*\*\*\* (غير مفهوم)



When the centriole wants to make cilia , make invigorating to apical and converts to give me cilia

## Intercellular junctions Lateral polarity “Modification”

(cell to cell adhesion)

The intercellular junctions are more **numerous between the epithelial cells**. They are three types

1- Occluding junctions: **(Tight )** link cells to form an impermeable barrier.

2- Anchoring junctions: **(Adhering)**

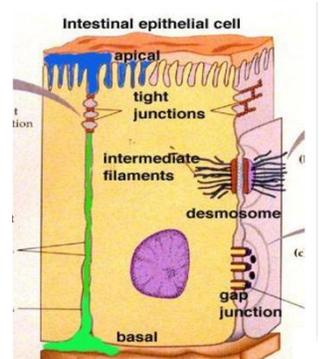
-provide mechanical stability to the epithelial cells.

-**Zonula adherens: Multipoint junction**

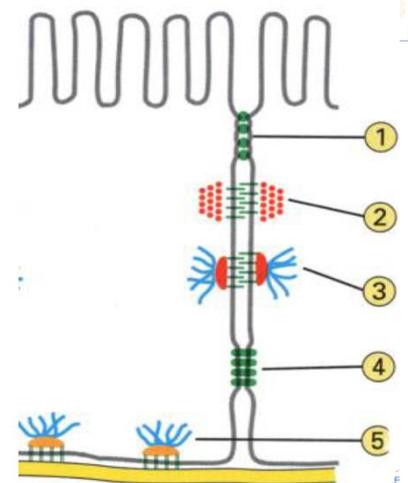
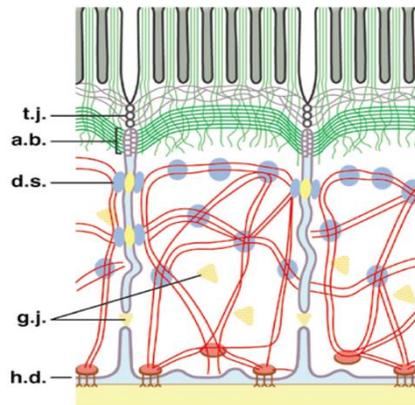
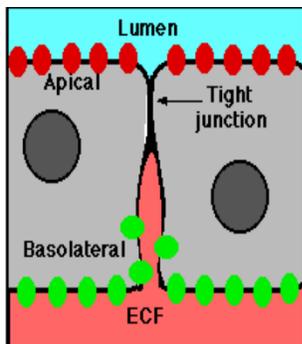
-**Macula adherens = desmosomes: Just at one point junction**

3- Communicating junctions: **(Gap)** allow movement of molecules between cells **It permits the exchange of molecules e.g. ions, amino acids allowing integration, communication and coordination between cells**

It is found mainly in cardiac and smooth muscle cells



## Intercellular junctions



## Basal modifications

### Basement membrane

**Basal infolding** The kidney make filtration 180 L/day but we get rid of proximally 1.5-2 L/day that's because basal infolding on reabsorption kidney tubes ,but this mechanism needs an energy so I need to a large numerous mitochondria

### Hemidesmosome

**Desmosome** : it is between two cell

**Hemidesmosome**: It is Between epithelium tissue and connective tissue

