



Histology Lecture (2)

Epithelial Tissue

Med433

Histology.team@gmail.com

Objectives:

By the end of this lecture, you should be able to:

- Describe general characteristics of epithelial tissue.
- Discuss microscopic structure and distribution of different types of epithelial membranes.
- Classify glandular epithelium according to different parameters.
- Enumerate the functions of epithelial tissue.
- Understand the following clinical applications:
 - Immotile cilia syndrome (Kartagener's syndrome).
 - Metaplasia.

Red = Important Orange = Explanation Purple = Extra

Types of tissue:

- **Epithelial**
- Connective
- Muscular
- Nervous

- ❖ **The lining** of hollow organs (Stomach) and **the covering** of outside surfaces (Skin) is **made up of Epithelial Membranes**
- ❖ Epithelial cells are **modified** to form **glands**

Characteristics

No spaces between the cells (tightly joined with junctions)

Avascular (No blood capillaries to supply it)

Rests on basement membrane

Since it is avascular, it gets its nutrients by **Diffusion from the C.T.** under the basement membrane

Regenerates quickly
(Skin: 3 weeks) (Stomach: 4 days)

Functions

1-Protection
as in epidermis of skin

2-Secretion
as in glands

3-Absorption
as in small intestine.

4-Excretion
as in kidney.

5-Reproduction
as in gonads.

6-Smooth lining
as in blood vessels.

Classification

1. Epithelial Membrane

2. Epithelial Glands

A) Simple Epithelium
(One layer of cells)

B) Stratified Epithelium
(Multiple layers of cells)

1. Epithelial Membrane

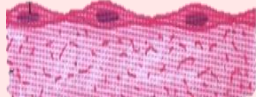





A) Simple Epithelium

Note:

Flat cell= flat nucleus

Cuboidal cell = round central nucleus

Columnar cell = oval peripheral (basal) nucleus

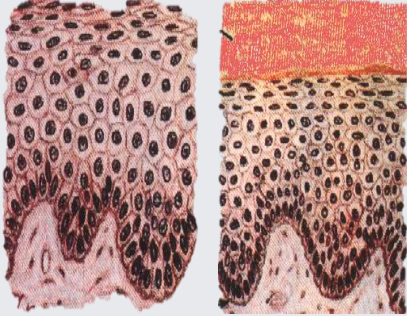
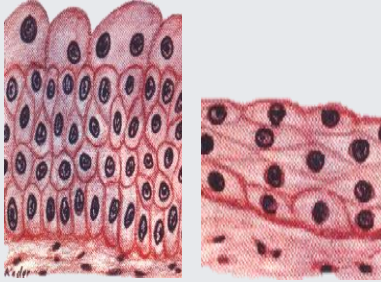
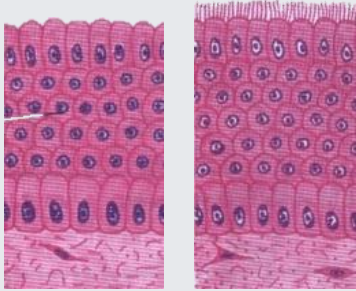


	<u>Simple Squamous</u>	<u>Simple Cuboidal</u>	<u>Simple Columnar</u>	<u>Pseudo-Stratified Columnar</u>
			  <p>Non-Ciliated Ciliated</p>	  <p>Non-Ciliated Ciliated (With Goblet cell)</p>
<u>Shape of cell & Nucleus</u>	<ul style="list-style-type: none"> Flat cells Flat nuclei <p>(Provide smooth surface)</p>	<ul style="list-style-type: none"> Cuboidal cells Round central nuclei 	<ul style="list-style-type: none"> Columnar cells Basal oval nuclei 	<ul style="list-style-type: none"> One layer of columnar cells Some are short, some are tall Nuclei appear on different levels
<u>Found in</u>	<ul style="list-style-type: none"> Endothelium (The lining of the CVS) Alveoli of lungs 	<ul style="list-style-type: none"> Thyroid follicles 	<p>Ciliated:</p> <ul style="list-style-type: none"> Fallopian tubes <p>Non-Ciliated:</p> <ul style="list-style-type: none"> Stomach Gall Bladder Intestines (With Goblet Cells) 	<p>Ciliated (with Goblet Cells):</p> <ul style="list-style-type: none"> Trachea Bronchi <p>Non-Ciliated:</p> <ul style="list-style-type: none"> Vas deferens
<u>Reason</u>	To allow facilitated diffusion and gas exchange	---	---	---
<u>Extra Notes</u>	Rich with nerve cells	Abundant in renal system	<ul style="list-style-type: none"> Cilia is Non-membranous Function of "<u>Goblet Cells</u>": Secretion of mucus 	<p>Pseudo = False, Fake</p> <p>It gives the impression that it is more than one layer but it is simple because all the cells are attached to the basement membrane</p>

B) Stratified Epithelium

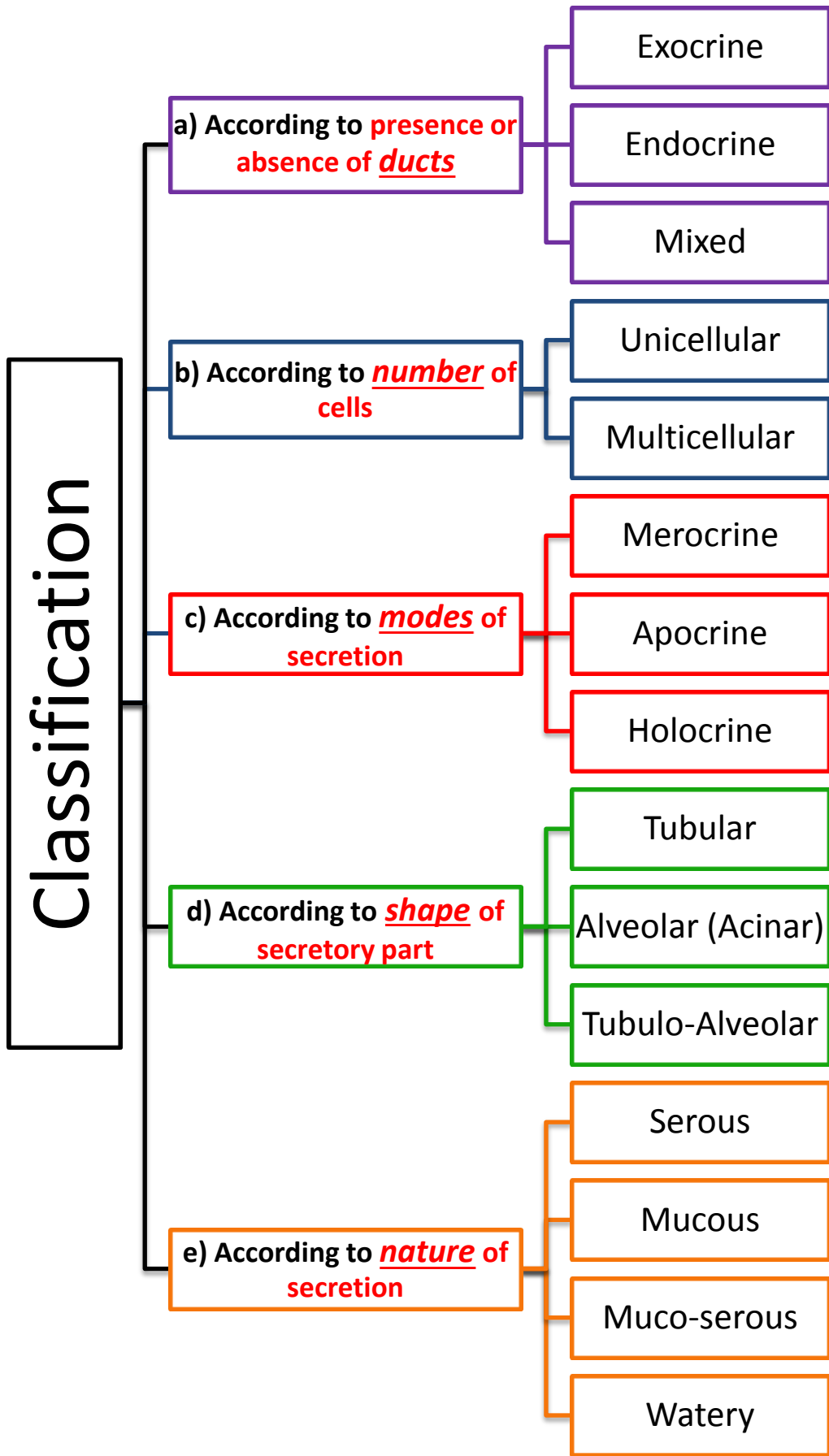
Basal Cells: **Columnar**

Intermediate Cells: **Polygonal**

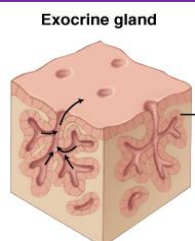
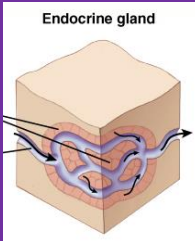
They are named according to their superficial layer

	<p><u>Stratified Squamous Epithelium</u></p>  <p>Non-keratinized Keratinized</p>	<p><u>Transitional Epithelium</u></p>  <p>Empty Viscus Full Viscus</p>	<p><u>Stratified Columnar Epithelium</u></p>  <p>Non-Ciliated Ciliated</p>
<p><u>Surface Cells</u></p>	<ul style="list-style-type: none"> • Flat • Flattened nuclei 	<ul style="list-style-type: none"> • Large cuboidal with convex free (Dome shaped) surface • Can be binucleated (2 nuclei in one cell) 	<ul style="list-style-type: none"> • Columnar
<p><u>Found in</u></p>	<ul style="list-style-type: none"> • <u>Keratinized</u>: Epidermis of skin • <u>Non-Keratinized</u>: Esophagus 	<ul style="list-style-type: none"> • Urinary bladder 	<ul style="list-style-type: none"> • Large ducts of glands
<p><u>Extra Notes</u></p>	<p>Keratin: A dead layer of tissue (skin) for protection – Clear in</p> 	<ul style="list-style-type: none"> • Does not have junctions • It is found in the urinary bladder to be able to withhold more urine. It has the ability to stretch (from 6-7 layers to 3 layers) <p>(مثال للتوضيح)</p>  <p>Empty Viscus (Compact) Full Viscus (Stretched)</p>	<p>(يشبه عنقود العنب)</p> <p>-Will be discussed this lecture page 7-</p>

2. Glandular Epithelium:



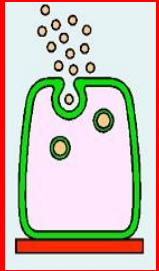
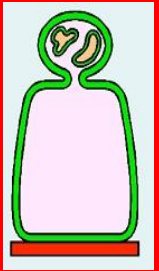
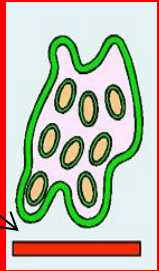
a) According to presence or absence of ducts:

<u>Exocrine</u>	<u>Endocrine</u>	<u>Mixed</u>
 <p>Exocrine gland</p>	 <p>Endocrine gland</p>	
Needs ducts	Secretes in blood directly	Uses both
Salivary glands	Thyroid glands	Pancreas

b) According to number of cells:

<u>Unicellular</u>	<u>Multicellular</u>
Goblet Cells (only)	Salivary glands

c) According to modes of secretion:

<u>Mero-crine</u>	<u>Apo-crine</u>	<u>Holo-crine</u>
		
No part of the cell is lost with the secretion	The top of the cell is lost with the secretion	The whole cell detaches with the secretion
salivary glands	mammary gland	sebaceous glands
<p><u>Easier clarification:</u> I am standing in a room and I throw a book outside.</p>	<p><u>Easier clarification:</u> I am standing in a room and I hand a book to someone outside (while I am still in the room).</p>	<p><u>Easier clarification:</u> I take the book and leave the room.</p>

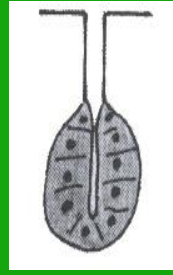
d) According to shape of secretory part:

Tubular



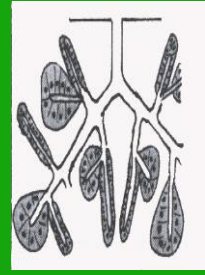
Intestinal gland

Alveolar (Acinar)



Mammary gland

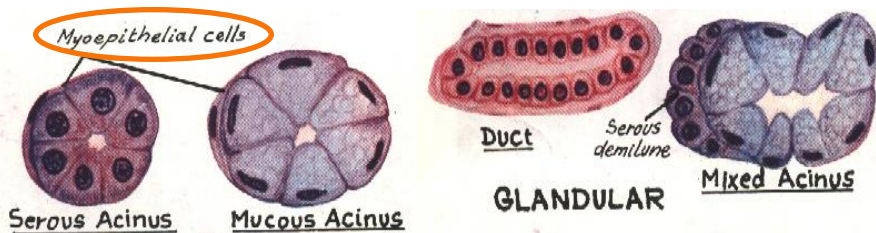
Tubulo-Alveolar



Pancreas
(يشبه عنقود العنب)

e) According to nature of secretion:

<u>Serous</u>	<u>Mucous</u>	<u>Muco-Serous</u>	<u>Watery</u>
Parotid gland	Goblet cells	Sublingual gland	Sweat gland
It's like the watery but it has protein in the form of enzymes	It's thick	---	Water & minerals only (No proteins)



- **Myoepithelial cells:**
It's a stimulator. It squeezes the gland (like how you squeeze a lemon)
- Present in:
 - > Mammary glands (When a mother is breastfeeding her child, milk is able to come out)
 - > Salivary glands (When you're hungry and you smell food, you're mouth waters)
- Why can it squeeze or Why is it called "Myoepithelial"?
Because it has myosin and actin (muscles) that contract.

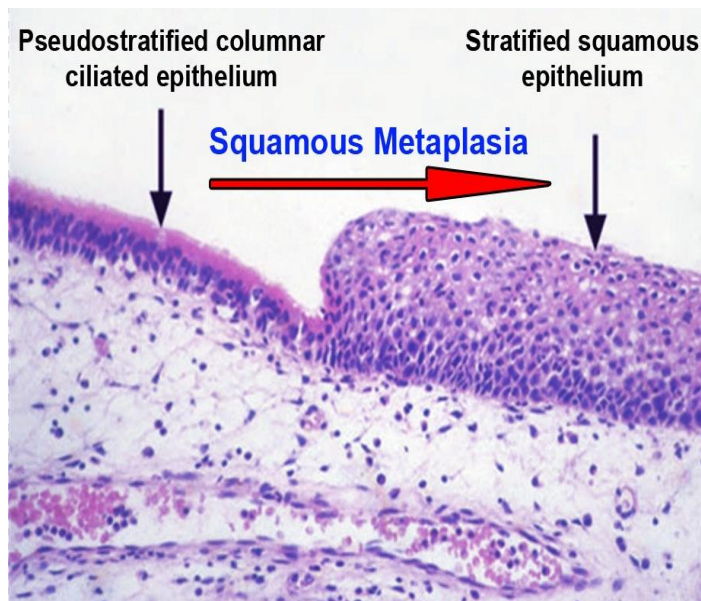
Clinical Applications

- **Immotile cilia syndrome:**

- **Disorders:**
 - **infertility** in male
 - **chronic respiratory tract infection** in both sexes.
- **Cause:** **immobility of cilia and flagella** induced by **deficiency of dynein**.
- **Dynein** protein is responsible for movements of cilia and flagella.

- **Metaplasia:**

- It is **the transformation of one type of tissue to another** in response to injury.
- This condition is usually reversible if the injury is removed.
- **Example:** pseudo stratified ciliated columnar epithelium of the respiratory passages, e.g. trachea, of heavy smokers may undergo **squamous metaplasia**, transforming into stratified squamous epithelium.



MCQs

1- *Epithelial tissue classified into epithelial membranes and...*

- a) Simple epithelial
- b) stratified epithelial
- c) glandular epithelial

2- *Simple cuboidal epithelium has*

- a) one layer of cuboidal cells
- b) two layers of cuboidal cells
- c) one layer of flat cells

3- *We can find the simple columnar epithelium (ciliated) in*

- a) Trachea
- b) fallopian tubes
- c) urinary bladder

4- *One of the differences between transitional epithelium and stratified squamous epithelium is that the surface cells of transitional epithelium has*

- a) flat cells with flattened nuclei
- b) large cuboidal cells
- c) columnar cells

5- *Tubular gland is an example of*

- a) mammary gland
- b) pancreas
- c) intestinal gland

6- *The deficiency of dynein (immotile cilia syndrome) causes infertility in*

- a) male
- b) female
- c) both sexes

1- c 2- a 3- b 4- b 5- c 6- a

Answers: