

Epithelial tissue:

Epithelium is an avascular tissue comprised of cells that cover the exterior surface of the body and line both the internal closed cavities of the body and those body tubes that communicate with the exterior such as (the alimentary canal, respiratory and genitourinary tracts). Epithelium also forms the secretory portion (parenchyma) of gland and their ducts and receptors of certain sensory organs. The cells that make up an epithelium have three principal characteristics:

- 1-They are found aggregated in close apposition to one another.
- 2-They exhibit a free or apical surface ; a lateral surface, and a basal surface.
- 3-They are attached to an underlying basement membrane. A non cellular protein – polysaccharide – rich layer demonstrable at the light microscopic level by histochemical methods.

Endothelium :- epithelial lining of vascular system.

Mesothelium :- epithelial lines walls and covers closed cavities such as thoracic, pericardial and abdomen.

N.B. the morphology of an epithelium often correlates with its function. The epithelium involved in secretion or absorption are typically simple or in few cases pseudostratified epithelium.

Function of epithelia:

- 1- It can be an almost impervious barrier, as in the epidermis or urinary bladder. Capable of facilitating or inhibiting the passage of specific substances between the exterior and body cavities and the underlying connective tissue.
- 2- It can be secretory, as in stomach.
- 3- It can be secretory and absorptive as in intestine.
- 4- It can provide a transport system through motile cilia on its surface to move the particulates and mucous as in trachea and bronchi.
- 5- It can serve to receive sensory stimuli as in the taste buds of the tongue or the retina of the eye.

Classification of epithelium :-

According to the cells arrangement (cellular layers)

- 1- Simple epithelia which have one cell layer.
- 2- Stratified epithelia which have two or more cell layers.

According to the cell shape in the superficial layer.

- 1- Squamous cell, width of the cell is greater than its height.
- 2- Cuboidal cell, width, depth, and height are the same.
- 3- Columnar cell, height exceed the width.
- 4- Pseudo stratified and transitional epithelia are special classification of epithelia.

Types of epithelia

Classification	location	function
Simple squamous	Endothelium	Exchange barrier
	Mesothelium	Exchange and lubrication
	Bowmans capsule	Exchange
simple cuboidal	Small ducts of exocrine gl.	Absorption and conducts
	Surface of ovary	Barrier
	Kidney tubules	Absorption
Simple columnar	Small intestine & colon	Absorption and secretion
	Stomach & gastric gland	Secretion
	Lining of gall bladder	Absorption
Pseudostratified	Lining of trachea & bronchi	Secretion and conducts
	Lining of deferens	Secretion and conducts
	Eff. ductules of epididymis	Absorption and conducts
Str. Squamous	Epidermis	Barrier and protection
Str. Cuboidal	Sweat gland, duct	Barrier and conduct
	Large duct of exocrine gl.	Barrier and conduct
	Anorectal junction	Barrier and conduct
Str. Columnar	Largest duct of exocrine gl.	Barrier and conduct
	Anorectal junction	Barrier and conduct
Transitional	Renal calyces	Barrier and distensible
	Ureter	Barrier and distensible
	Urinary bladder	Barrier and distensible
	Urethra	Barrier and distensible

Basement membrane :-

Two basal lamina and reticular lamina under the light microscope we can see basement membrane in the trachea and some time in urinary bladder and ureter. The basement requires stain (PAS. stain).

The function of basement membrane :-

- 1- Structural attachment.
- 2- Filtration : in kidney.
- 3- Polarity induction: apical, basal, lateral membrane.
- 4- Tissue scaffolding a guide or scaffold during regeneration.
- 5- Osmosis.

Intercellular contacts:-

The electron microscope has shown it to be the site of specialized attachment of adjoining epithelial cells.

Some of intercellular contacts types :-

Zonula occludens: (tight junction) the diffusion barrier it is located at the most apical point forming a ring.

Zonula adherens: a continuous band –like adhesion. Surround the cell and joins it to its neighbors.

Macula adherens: (desmosome) spot adhesion located at multiple sites on the upper lateral surface of adjoining cells.

Hemidesmosome: are found on the basal cell surface where they provide increased adhesion to the basal lamina.

The cell surface modification :-

- 1- Microvilli : cytoplasmic processes that extend from the cell surface finger like cytoplasmic projections on the apical surface to form the striated border for intestinal absorptive cells and brush border of kidney.
- 2- Cilia : motile cytoplasmic processes capable of moving fluid and particles along epithelial surfaces. Cilia contain an organized core of microtubules.
- 3- Stereocilia : microvilli on the luminal surface of epididymis, sensory (hair) cells of the ear.

Gland :-

They are a special structures formed from epithelial cells which specialized for secretion. They usually produce aqueous fluid which differ from blood plasma and tissue fluid. This product of cellular activity is called secretion. This secretion called (Hormones and Enzymes).

The gland have been classified in many ways:-

1- According to the mode of secretion divided into :

A-Exocrine : which have duct that trans their productions to an external and internal surface.

B-Endocrine : without duct (ductless) internal secretion to the blood vessels.

2- According to the nature of secretion :

A-Mucous : the secretion contain mucigen granules.

B-Serous : the secretion is watery contain enzymes.

C-Mixed : the part of secretory unit produced mucous and the other unit produced the serous secretion.

3- According to the gland cell behavior during secretion :

A-Merocrine : which dose not involved cell destruction but exocytosis.

B-Holocrine : which is accompanied by cell death.

C-Apocrine : which takes place with a loss of some cytoplasm only with rupture of cell membrane.

4- According to the number of cell components :

A-Unicellular gland. Which composed of one cell.

B-Multicellular gland. Which composed of many cells.

Multicellular gland divided into :

1- Simple multicellular gland.

2- Compound multicellular gland.

Simple multicellular gland which including :

These gland arise as invagination of epithelium tissue into the underlying connective tissue.

1- Simple straight tubular gland: this type has a single, straight tubular lumen as secretory unit, which the secretory product are

discharged. The straight portion opens directly on the epithelial surface, e.g. large intestinal gland.

- 2- Simple coiled tubular gland: this type has secretory unit as single tubule which is coiled in terminal portion, e.g. sweat gland.
- 3- Simple branched tubular gland: the terminal portion of secretory unit of this type branching into two or more branches, e.g. stomach and utrine gland.
- 4- Simple acinar gland: the terminal portion of this type as a spherical or elongated sac, e.g. bulbo urethral gland.
- 5- Simple branched acinar gland: the terminal portion of this type has spherical secretory unit but it is subdivided into smaller acini, e.g. sebaceous gland.

Compound multicellular gland :

A compound gland may consist of larger sub division called lobes which are also subdivided by connective tissue into smaller parts which called lobule. The lobule contain the glandular units.

According to the terminal portion of this gland divided into:

- 1- Compound tubular gland : it is consist of branch ducts system and tubular secretory unites which is coiled and branch, e.g. brunners gland of the duodenum.
- 2- Compound acinar gland : it is consist of branch duct system and acinar secretory unit, e.g. pancreas gland and parotid salivary gland.

- 3-** Compound tubule-acinar gland: this gland has secretory units consist of branched tubular compound with acinar end pieces called demilunes, e.g. submandibular salivary gland.