Epithelium

epithelium is one of the four basic tissues of the body , is derived from all three germ layers. It is composed of very closely packed, contiguous cells, with very little or no extracellular material in the extracellular spaces. Epithelia either form membranes that are represented as sheets covering the body surface and lining its internal surface or occur as secretory elements known as glands. Almost always, epithelia and their derivatives are separated from underlying or surrounding connective tissues by a thin, non cellular layer, **the basement membrane**. This is usually composed of two regions, the epithelially derived **basal lamina** and the connective tissue–derived **lamina reticularis**. Epithelium covers nearly all body surfaces.

The basic functions of epithelial tissue are

(1) protection of the body from abrasion and injury (e.g., skin and esophagus);

(2) absorption of material from a lumen (e.g., tubules in kidney, small and large intestines);

(3) transportation of material along a surface (e.g., cilia-mediated transport in the trachea);

(4) secretion of mucus, hormones, and proteins (e.g., glands);

(5) gas exchange (e.g., alveoli in the lung); and

(6) lubrication between two surfaces (e.g., mesothelium of pleural cavity).

Classification of Epithelial Tissues

Epithelium can be classified as simple(is a single layer of cells) or stratified(there are two or more layers of cells) based on the number of layers of cells.

In a simple epithelium, all of the cells contact the basal lamina and reach the free surface. In pseudostratified epithelia (which may or may not possess cilia or stereocilia), however, all of the cells contact the basal lamina, although some cells are much shorter than others and do not reach the free surface. Therefore, this is a simple epithelium that appears to be stratified.

Types of Simple Epithelium

1. Simple squamous epithelium

is composed of one layer of uniform flat cells, which rest on the basement membrane.Apical surfaces are smooth, and the width of the cells is greater than their height. The nuclei appear flattened and can easily be recognized following hematoxylin and eosin staining (H&E) because of the basophilia (affinity for blue stains) of the nucleic acids in the nuclei. This type of epithelium is found lining the posterior surface of the cornea; and lining the alveoli of the lungs.

2. Simple cuboidal epithelium

is composed of one layer of uniform cuboidal cells, which rest on the basement membrane. The cell's height, width, and depth are roughly equal. Nuclei are centrally placed and spherical in shape. Some cuboidal cells have long and abundant microvilli, which form a brush border on their apical surfaces. Such cells are found in the proximal tubules of the kidney. Other cuboidal cells have

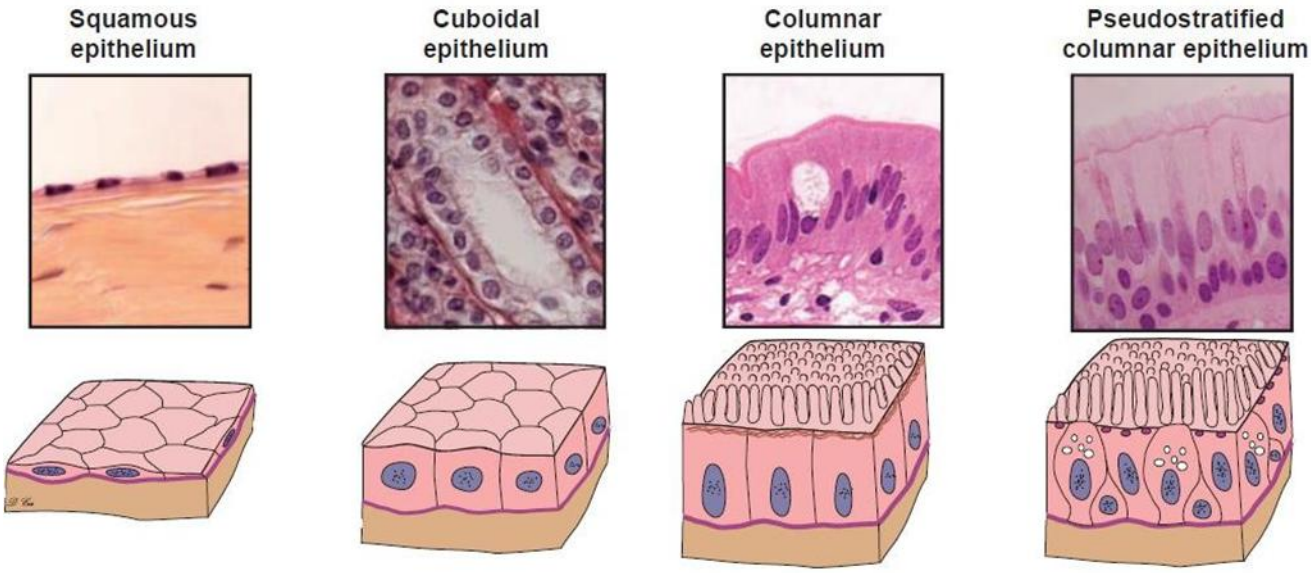
few, short microvilli which do not form a brush border; these cells can be found in the distal and collecting tubules of the kidney. Simple cuboidal epithelium is mainly found lining most of the tubules in the kidney and in some excretory ducts of glands.

3. Simple columnar epithelium

is composed of one layer of columnar cells resting on the basement membrane . The cell's height is greater than the width. The elongated ovoid nucleus is most often located in the basal region of the cell. The apical surface of this epithelium may reveal microvilli. Microvilli are often densely packed to form a brush border and function to increase the apical surface area of the cell to aid in absorption of fluid and other material from a lumen. Simple columnar epithelium can be found in the digestive tract, oviducts (fallopian tubes) in the female reproductive system, and ductuli efferentes testis of the male reproductive system.

4. Pseudostratified columnar epithelium

is composed of one layer of non uniform cells that vary in shape and height. Cells appear similar to stratified cells, but all cells are in contact with the basement membrane. In general, most cells are tall columnar cells, but there are also some short basal cells, some of which are stem cells. The most widespread type of pseudostratifi ed columnar epithelium is found in the respiratory tract and has long fingerlike,motile structures called cilia on the apical surface of the cells. Cilia aid in the transport of material across the surface of epithelial cells. Pseudostratified columnar epithelium is often referred to as respiratory epithelium because it is found in the linings of the respiratory tract, including the nasal cavity, trachea, and primary bronchi.



Types of Stratified Epithelium

1.Stratified squamous epithelium

contains several layers of cells, with cells in the superficial layer being flattened.Only the deepest layer of cells is in contact with the basement membrane. This type of epithelium protects the body against injury, abrasion, dehydration, and infection. This epithelium may be keratinized or non keratinized, depending on functional demands. Keratinized stratified squamous epithelium is found in the skin. The top layers consist of either thick or thin keratinized cells (flattened, nonnucleated dead cells.

2.Stratified cuboidal epithelium

is composed of two or three layers of cuboidal cells with the basal layer of cells often appearing non uniform in distribution. Itis mainly found lining large ducts of

exocrine glands. The cells often have smooth apical surfaces and form barriers and ducts.

3.Stratified columnar epithelium

is also composed of two or three layers of cells. The top layer is columnar in shape and the basal layer is usually cuboidal in shape. This is not a common type of epithelium and has a very limited distribution. Occasionally, it can be found in the conjunctiva of the eye and in some large ducts of the exocrine glands.

4.Transitional epithelium

is stratified epithelium, often referred to as urothelium, which lines the excretory channels leading from the kidney (renal calyces, ureters, bladder, and proximal segment of the urethra). It may contain four to six cell layers in the relaxed state. However, the histological appearance of the epithelium can change when stretched.