Epithelial tissue : Epithelium is classified by both it's cellular morphology and the number of cell layers. Based on morphology, epithelial cells can be either squamous (flat), cuboid (cube) or columnar (rectangular). Depending on the number of layers, epithelial tissue is classified into simple (single layered) or stratified (multi-layered)

A- Simple Epithelium

Simple epithelium can be subdivided according to the **shape and function** of its cells. *Squamous (thin cells), *cuboidal (cells roughly as thick as they are wide) or *columnar (cells taller than they are wide).

<u>1-Simple Squamous epithelium</u>

Simple squamous epithelium is composed of a single layer of tightly packed, thin, or low-profile polygonal cells. Squamous cells, for example, tend to have horizontal flattened, elliptical nuclei because of the thin flattened form of the cell. They form the lining of cavities such as the mouth, blood vessels, heart and lungs and make up the outer layers of the skin. Simple squamous epithelium lining the lumen surface of all types of blood vessels and lymphatic vessels is called an endothelium (sometimes a vascular endothelium). The endothelial cells are flattened and elongated, and they always rest on a thin basement membrane. Endothelial cells of vessels sense changes in blood pressure, oxygen tension, and blood flow and respond to these changes by secreting substances, which have effects on the tone of vascular smooth muscle.



Fig.1 Simple Squamous epithelium

<u>2- Simple cuboidal epithelium</u>: A single layer of polygon-shaped cells constitutes simple cuboidal epithelium. When viewed in a section cut perpendicular to the surface, the cells present a square profile with a centrally placed round nucleus. Simple cuboidal epithelia make up the ducts of many glands of the body, form the covering of the ovary, and compose many kidney tubule.



Fig.2.Simple cuboidal epithelium

3- Simple columnar epithelium

The cells of simple columnar epithelium appear tall, rectangular cells whose ovoid nuclei are usually located at the same level in the basal half of the cell. Simple columnar epithelium lines much of the digestive tract, gallbladder, and large ducts of glands. Simple columnar epithelium may exhibit a striated border, or microvilli (narrow, finger-like cytoplasmic processes), projecting from the apical surface of the cells. The simple columnar epithelium that lines the uterus, oviducts, and small bronchi is ciliated. In these organs, cilia (hairlike structures) project from the apical surface of the columnar cells into the lumen. Cells of simple columnar epithelia are taller than they are wide. Such cells are usually highly specialized for absorption, with microvilli, and often have interspersed secretory cells or ciliated cells. Such epithelial cells always have tight and adherent junctional complexes at their apical ends, but are often loosely associated in more basolateral areas. This allows for rapid transfer of absorbed material to the space between the cells rather than transport the full length of the cells. The additional cytoplasm in columnar cells allows additional mitochondria and other organelles needed for absorption and processing. The examples shown here are from a renal collecting duct (a), the oviduct lining, with both secretory and ciliated cells (b), and the lining of the gall bladder (c) (Fig.3).





Fig.3. Simple columnar epithelium

4- <u>Pseudostratified Columnar Epithelium</u>: Cells of pseudostratified epithelia appear to be in layers, but the basal ends of the cells are all in contact with the basement membrane, which is often very thick in these epithelia. The best example of this epithelial type is the pseudostratified ciliated columnar epithelium of the upper respiratory tract, which



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Fig.4. Pseudostratified Columnar Epithelium