

Epithelial Membrane Classification

Number of Cell Layers

Simple [1 layer]

Stratified [2+ layers]

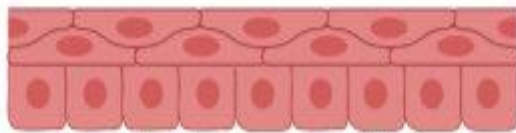
Pseudostratified [1 layer; staggered]
shaped]

Shape of Cells*

Squamous [flat, "scale-like"]

Cuboidal [square; height \approx width]Columnar [tall, column-
shaped]

*stratified epithelia are classified by the most superficial (i.e. apical) layer



Stratified Squamous Epithelium



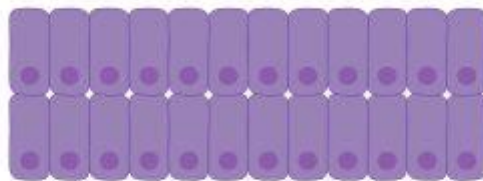
Simple Squamous Epithelium



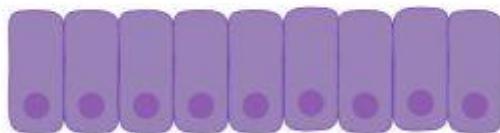
Stratified Cuboidal Epithelium



Simple Cuboidal Epithelium



Stratified Columnar Epithelium



Simple Columnar Epithelium



Pseudostratified Columnar Epithelium

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The different specialized **structures** of epithelial tissues give us clues about their **functions**. Let's take a closer look!

Protection

Epithelia provide a layer of protection for all underlying tissues from toxins, pathogens, trauma, etc. e.g. *stratified squamous keratinized epithelium of the skin*.

Absorption and/or Secretion

Depending on the location, some epithelia are involved in absorption (often facilitated by microvilli) or secretion e.g. *simple cuboidal epithelium of the choroid plexus*.

Motility

Some epithelia have motile cilia on their apical surface that move in coordinated waves to move particles (e.g. mucus) e.g. *ciliated pseudostratified columnar epithelium of the trachea*.

Sensation

While the majority of epithelia are avascular, they are innervated; some are more extensively innervated than others e.g. *stratified squamous non-keratinized epithelium of the cornea*.

Epithelial Glands

Comprised of organized collections of secretory epithelial cells, glands (also called *glandular epithelia*) are broadly divided into two categories: **endocrine** (without ducts) & **exocrine** (with ducts). In general, epithelial glands develop as a down-growth of epithelium into the connective tissue below. Some glands will separate from the surface epithelium whence it originated (**endocrine**), while others will maintain a connection via ducts (**exocrine**).

*Without further ado, let's dive right in to the *secretive* world of glands!*

Endocrine Glands

Since they are ductless, endocrine glands release their secretions—called *hormones*—directly into the bloodstream for distribution to target tissues with specialized receptors. The endocrine system plays a very important regulatory role throughout the body.

Examples include the **pituitary gland**, the **ovaries & testes**, and the **pancreas***.

Exocrine Glands

Exocrine glands release their secretions into a lumen (*from latin "lumen" = "light / an opening"*) through an epithelial-lined tube called a **duct**. Like epithelial membranes, there are several criteria for the classification of exocrine glands

Structure of the Duct

Simple [duct doesn't branch]

Compound [duct branches]

Shape of the Secretory Units

Tubular [long & thin / tube-like]

Acinar / Alveolar [spherical / flask-like]

Tubuloalveolar [mix of both types]

Mechanism of Secretion

Merocrine [exocytosis; secretory vesicles]

Apocrine [piece of apical cell pinches off]

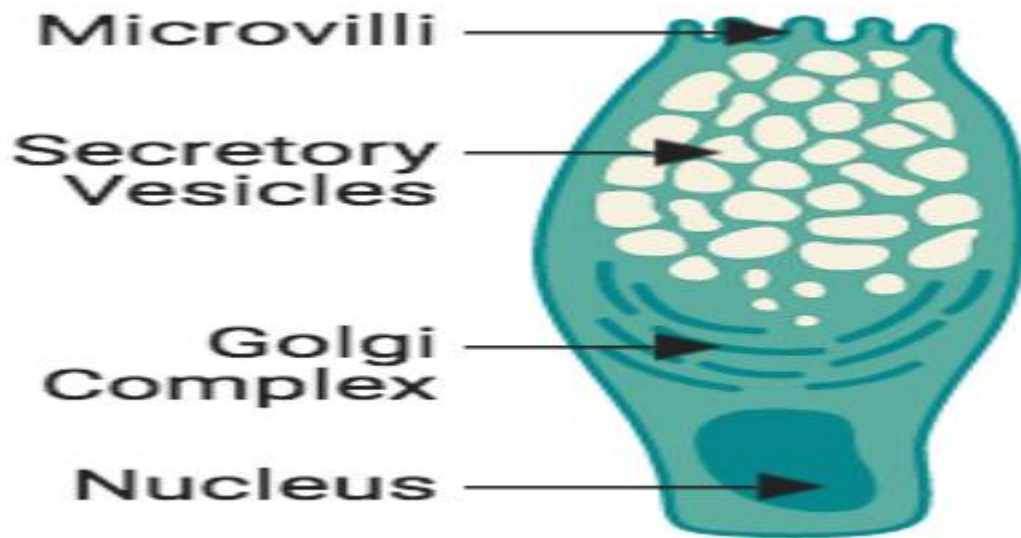
Holocrine [breakdown of entire secretory cell]



Goblet Cells

While most exocrine glands are **multicellular**, goblet cells are the only example of **unicellular exocrine glands** in mammals!

These specialized epithelial cells secrete mucus and are typically found in simple and pseudostratified columnar membranes. Goblet cells appear pale in H&E-stained sections due to the high concentration of mucin-containing secretory vesicles.



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