

Glandular Epithelium

Glandular epithelium consists of specialized cells that synthesize substances, store them in secretory granules and release them into extracellular space. Glands can be single-celled (ex. goblet cells in respiratory epithelium) or multicellular forming secreting organs.

Based on how they function glands are separated into two categories:

- **endocrine**
- **exocrine**

Endocrine Glands

Endocrine glands do not secrete onto an epithelial surface via a duct. Instead their secretions, known as hormones, are stored in secretory vesicles that are sporadically released into the extracellular space and diffuse into the bloodstream. There are two types of endocrine glands:

- **Follicular**
- **Strings of anastomosing epithelial cells between capillaries**

Exocrine Glands

Exocrine glands are connected to an epithelial surface either directly or via a duct, these are separated into two parts, the secretory unit and of course the duct. All exocrine glands can be classified by:

- shape of the secretory unit,
- the branching of the duct,
- the type of secretion,
- the mechanism of secretion.

Classification by Shape of the Secretory Unit

The secretory unit consists of one layer of cells that sit on a basal lamina and secrete their product into a central lumen. The types differentiated by shape are:

- **acinar**- a spherical secretory unit with a narrow lumen (ex. pancreas and parotid gland),
- **tubular**- a tube shaped secretory unit with a narrow lumen (ex. eccrine sweat glands and sebaceous glands),
- **alveolar**- a pear shaped secretory unit with a wide lumen,
- **tubuloacinar**- they can be found in mixed glands, the secretory unit has the shape of a tube with a spherical enlargement at the end(ex. submandibular gland and sublingual gland),
- **tubuloalveolar**- they can also be found in mixed glands, they have a tube shaped secretory unit with a pear shaped enlargement at the end (ex. mammary gland during lactation and apocrine sweat glands).

Classification by the Branching of the Duct

- **Simple**- they have one unbranching duct that is connected to one or more secretory units. A Gland that has multiple secretory units connected to a single duct is called a simple branched gland.
- **Compound**- they have branched ducts, larger glands consist of lobules that are separated with connective tissue septa, the ducts of these glands are further classified as:
 - **intralobular**
 - **interlobular**

Classification by the type of secretion

- Serous glands produce serous fluid, a watery protein rich secretion. They contain serous cells organized into acinar secretory units. Serous cells have round nuclei and have an extensive rough endoplasmic reticulum, which causes them to be basophilic. Their secretory granules are located at the apical pole of the cell.
- Mucous glands have tubular secretory units filled with mucous cells. They produce a thick secretion with a large amount of mucin.

Classification by Secretion Mechanism

Merocrine Secretion

The term merocrine secretion is sometimes used interchangeably, but is usually used in relation with eccrine sweat glands. In this type of secretion molecules and ions are secreted gradually with no damage being done to the cell. Hydrophilic molecules require energy to be transported across the cellular membrane; for instance, protons in the

stomach or bile acid in the liver. The opposite being the secretion of hydrophobic molecules, which do not require any additional energy, they can pass through the membrane passively, a good example would be steroid hormones.

Apocrine Secretion

During apocrine secretion the secretory product is gathered at the apical pole of the cell, then membrane curves outward, pinches off and the product is released in membrane bound vesicles. This type of secretion is uncommon in the human body, the best example would be the mammary gland.

Holocrine Secretion

This type of secretion is only present in the sebaceous glands of the skin and the meibomian glands of the eyelid. During holocrine secretion the product slowly fills the entire cell and the organelles are gradually disassembled. The pyknotic nucleus begins fragmentation and the entire cell undergoes apoptosis. The product is then released with the remains of the cell after the cell membrane loses its integrity.

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References