

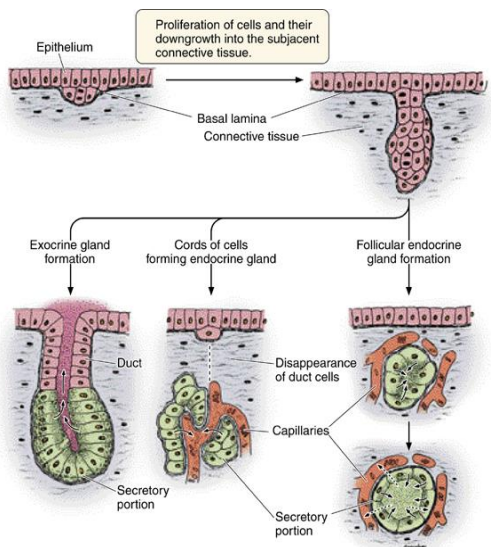
Lecture 3

Glandular epithelia

Glandular epithelia are tissues formed by cells specialized to produce secretion. The molecules to be secreted are generally stored in the cells in small membrane-bound vesicles called **secretory granules**

Glandular epithelial cells may be synthesize store, and secrete protein (e.g. Pancreas), lipids (e.g. adrenal, sebaceous gland), or complexes of proteins and carbohydrates (e.g. salivary glands). The mammary glands that have low synthesizing activity (egg. Sweat glands) and that secrete mostly substances transferred from the blood to the lumen of the gland.

Formation of glands from covering epithelia. Epithelial cells proliferate and penetrate connective tissue. They may—or may not—maintain contact with the surface. When contact is maintained, exocrine glands are formed; without contact, endocrine glands are formed. The cells of endocrine glands can be arranged in cords or in follicles. The lumens of the follicles accumulate large quantities of secretions; cells of the cords store only small quantities of secretions in their cytoplasm. Histology, 6th ed. Lippincott, 1969.)



Type of Glandular epithelia

The epithelia that form the glands of the body can be classified according to various criteria.

1- According to the number of the cells forming the gland:

-unicellular glands consist of isolated glandular cells, an example of a unicellular gland is the ***goblet cell*** of the lining of the small intestine or of the respiratory tract it's a cup shaped has a narrow base and a wide upper surface the nucleus is flat based in location the apical cytoplasm is pale filled with mucin droplets (which is a glycoprotein in nature) when the material is released from the cell, they form a viscous elastic gel called mucus which is a lubricant and protective material.

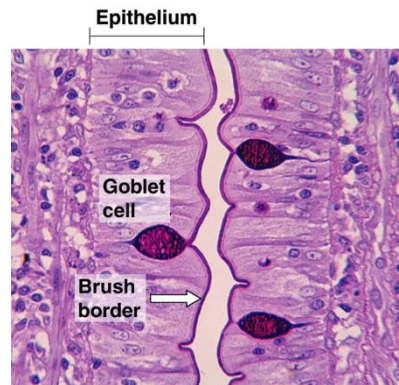


Figure: Section of intestinal villi stained by the PAS technique, a procedure that detects some polysaccharides. Note the positive reaction in the goblet cells and brush border, which consists of microvilli associated with the sugar-rich cell coat. Counterstained with hematoxylin. Medium magnification.

-Multi-cellular glands are composed of clusters of cells. The term gland however, is usually used to designate large complex aggregation of glandular epithelia cells, such as in the salivary glands and the pancreas glands always arise from covering epithelia by means of cell proliferation and invasion of subjacent connective tissue, followed by further differentiation.

2-According to the mode of secretion into:

-**Exocrine glands** retain their connection with the surface epithelium from which they originated. This connection takes the form of tubular ducts lined epithelial cells through which the glandular secretions pass to reach the surface.

-**Endocrine glands** are those whose connection with the surface from which they originated was obliterated during development. These glands are therefore ductless, and their secretions are picked up and transported to their site of action by the bloodstream rather than by a duct system.

Two types of endocrine glands can be differentiated according to cell grouping:

In the first type, the agglomerated cells form anastomosing cords interspersed between dilated blood capillaries (e.g. Adrenal glands, parathyroid, anterior lobe of the pituitary). hormones are secreted by the cells are transferred directly to the blood capillaries

In the second type: the cell lines a vesicles or follicles filled with non cellular material, between them capillaries are present (e.g. Thyroid gland).

-**Mixed glands: these** are characterized by having both exocrine and endocrine parts (e.g. Pancreas)

Exocrine glands have a **secretory portion**, which contains the cells responsible for the secretory process and duct, which transport the secretion to the exterior of the gland.

3-According to the type of the duct into:



Simple tubular



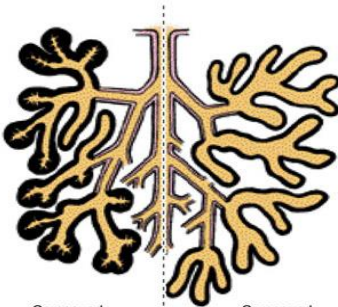
Simple coiled tubular



Simple branched tubular



Simple branched acinar



Compound tubuloacinar

Compound tubular



Compound acinar

-**Simple multi-cellular gland** has only one unbranched duct, according to the shape of the secretory portion these glands are further classified into:

A-Simple tubular glands are consists:

- **Simple straight tubular glands:** present in small intestine were they are called (crypts of Lieberkuhn)
- **Simple branched tubular glands:** the secretory part is branched e.g. In stomach
- **Simple coiled tubular glands:** the secretory part is very long tubular and coiled (e.g. in sweat gland)

B-Simple alveolar glands: the secretory part of this gland expand to form sacs or alveoli Simple glands can be tubular, coiled tubular, branched tubular or acinar

-Compound multi-cellular glands have ducts that branch repeatedly. The cellular organization within the secretory portion differentiates the glands further. Compound glands can be:

- Compound tubular gland: the functional (secretory) part is tubular in shape e.g. The kidney and mouth cavity glands
- Compound alveolar acinar the secretory part is alveoli e.g. mammary and salivary glands
- Compound tubuloacinar some organs have both endocrine and exocrine function and one cell type may function both ways e.g. in the liver where cell that secrete bile into the duct system also secrete some of their products into the bloodstream. In other organ, some cells are specialized in the exocrine secretion and other specialized in the endocrine secretion in the pancreas for example the acinar cells secrete digestive enzyme into the intestinal lumen, whereas the islet cells secrete insulin and glucagons into the blood.

4-According to the way in which the secretory products leave the cell, gland can be classified as

- **Merocrine** during secretion the secretory cells remain intact and the secretion is released by exocytosis (e.g. Salivary glands and pancreas) with no loss of other cellular material.
- **Holocrine** (Gr holos: whole, + krinein). Holocrine gland (e.g. sebaceous gland) the product of secretion is shed with the whole cell a process that involves destruction of the secretion filled cells.
- **apocrine** (Gr apo: away from +krinein) In an intermediate type- the gland secretory product is discharged together

with parts of the apical cytoplasm after that the cell will regenerate e.g. Mammary glands

5-According to the type of secretion into:

1-serous glands: they secrete watery albuminous material e.g. parotid gland and pancreas (the exocrine part) this type of glands is made up of many serous alveoli are characterize by the following histological characteristics:

- They are lined with pyramid shape cells
- The boundaries between the cells are not very clear
- The nuclei are round euchromatic showing clear nucleus
- The basal cytoplasm is basophilic because its rich in RER and Golgi complex
- The apical cytoplasm is granulated these granules are called zymogen
- The lumen is very small

2-Mucos gland: it secret mucus substance e.g. sublingual gland. The mucus alveoli have the following histological characteristics

- The alveoli are lined by columnar shape cells
- The boundaries between the cells are clear
- The apical cytoplasm is pale
- The nucleus is flattened based in location because of the heavy weight of mucin material

- The basal cytoplasm is rich in RER and Golgi complex
- The lumen is larger of that of serous glands

2-mixed gland: in this type of glands both serous and mucous alveoli are present in addition to that some of the mucous alveoli are surrounded from one side by serous cells forming a crescent; these cells are also called (serous demilunes). The cells forming the serous and granulated cytoplasm their secretion is transferred to the lumen of the alveolus by fine canaliculi present in between the mucous cells

Multicellular glands usually have a surrounding capsule of connective tissue and septa that divides the glands into lobules. These lobules then subdivide, and in this way the connective tissue separates and binds the glandular components together, blood vessels and nerves also penetrate and subdivide in the gland.