Glandular Epithelium

Glandular Epithelial Tissue

Epithelial cells that function mainly to produce and secrete various macromolecules may occur in epithelia with other major functions or comprise specialized organs called glands.

Secretory cells may synthesize, store, and release proteins (e.g. in the pancreas), lipids (e.g. adrenal, sebaceous glands), or complexes of carbohydrates and proteins (e.g. salivary glands).

Epithelia of mammary glands secrete all three substances.

The cells of some glands (e.g. sweat glands) have little synthetic activity and secrete mostly water and electrolytes (ions) transferred from the blood.

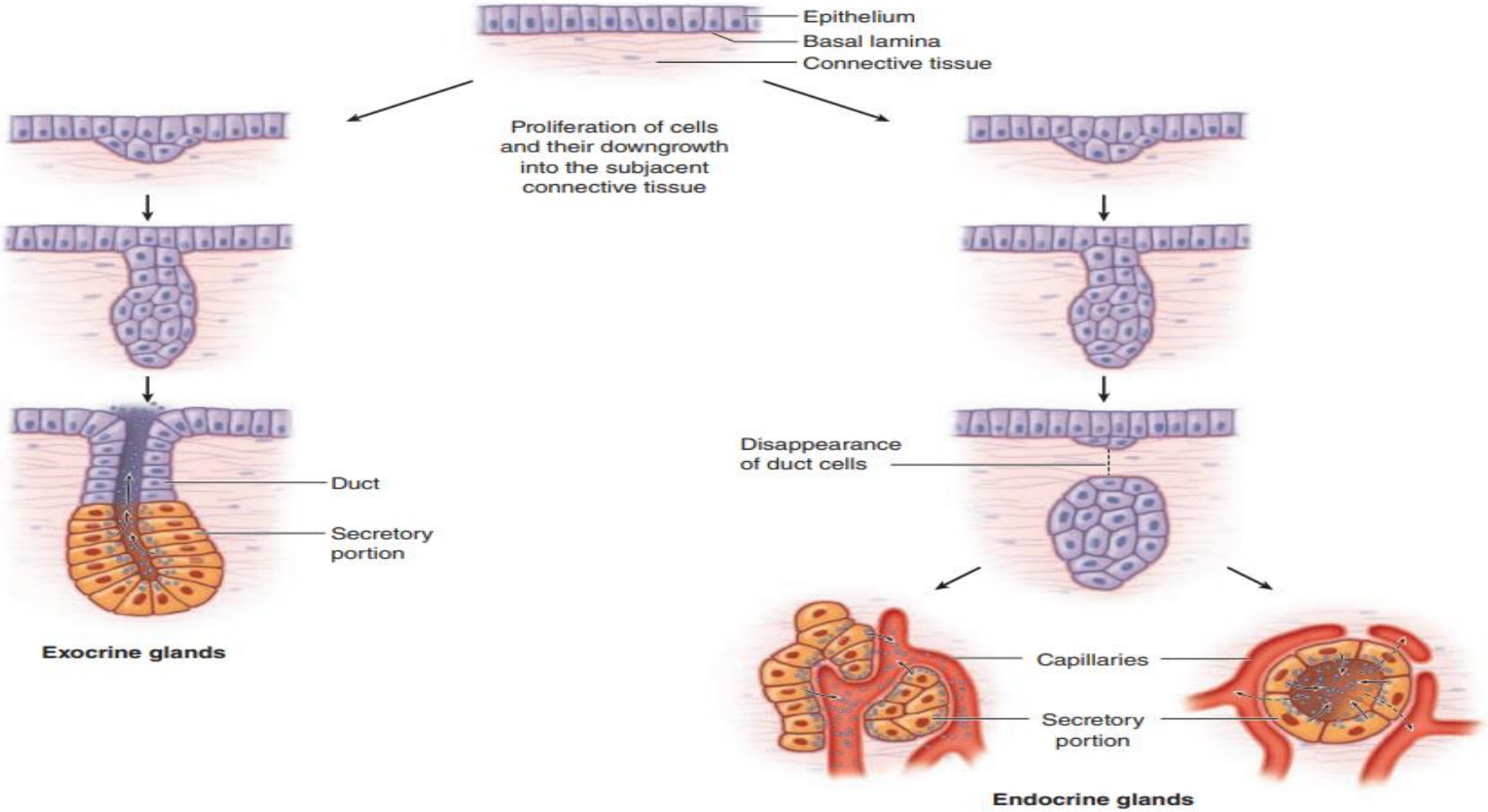
Unicellular glands, are common in simple cuboidal, simple columnar, and pseudostratified epithelia. An important, easily seen example is the goblet cell abundant in the lining of the small intestine and respiratory tract .

Types of glands:

1- **Exocrine glands**: remain connected with the surface epithelium, the connection forming the tubular ducts lined with epithelium that deliver the secreted material where it is used (contain duct).

2- **Endocrine glands**: lose the connection to their original epithelium and therefore lack ducts. Thin-walled blood vessels (capillaries) adjacent to endocrine cells absorb their secreted hormone products for transport in blood to target cells throughout the body (without duct).

FIGURE **4–19** **Formation of glands from covering epithelia.**

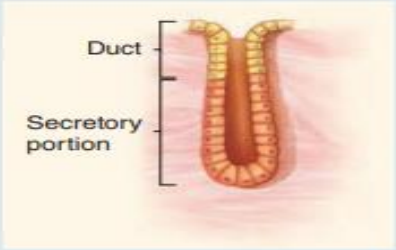


- **Glands can be**
  A-Simple (ducts not branched) or
  B- Compound (ducts with two or more branches).
- **Secretory portions can be:**
  - Tubular (either short or long and coiled)
  - Acinar (rounded and saclike);

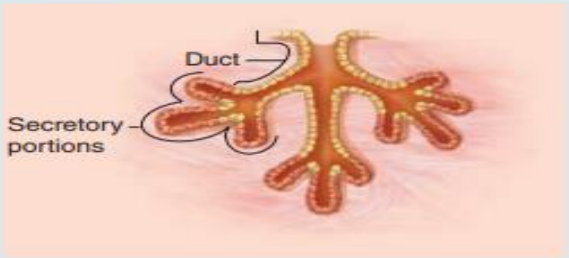
Either type of secretory unit may be branched, even if the duct is not branched

- **Compound glands** can have branching ducts and can have multiple tubular, acinar, or tubuloacinar secretory portions

SIMPLE Glands (Ducts Do Not Branch)

Class	Simple Tubular	Branched Tubular	Coiled Tubular	Acinar (or Alveolar)	Branched Acinar
					
Features	Elongated secretory portion; duct usually short or absent	Several long secretory parts joining to drain into 1 duct	Secretory portion is very long and coiled	Rounded, saclike secretory portion	Multiple saclike secretory parts entering the same duct
Examples	Mucous glands of colon; intestinal glands or crypts (of Lieberkühn)	Glands in the uterus and stomach	Sweat glands	Small mucous glands along the urethra	Sebaceous glands of the skin

COMPOUND Glands (Ducts from Several Secretory Units Converge into Larger Ducts)

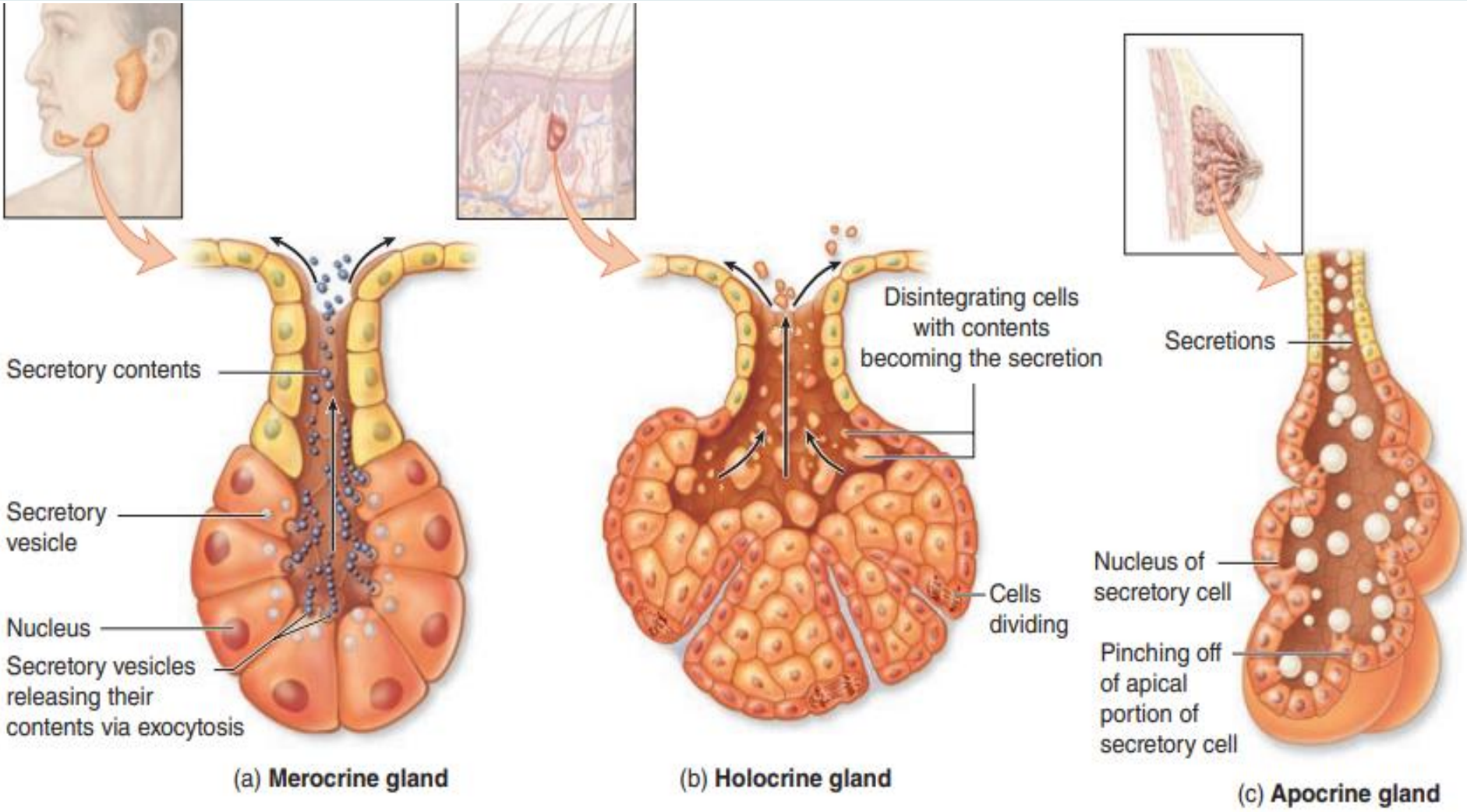
Class	Tubular	Acinar (Alveolar)	Tubuloacinar
			
Features	Several *elongated* coiled secretory units and their ducts converge to form larger ducts	Several *saclike* secretory units with small ducts converge at a larger duct	Ducts of both tubular and acinar secretory units converge at larger ducts
Examples	Submucosal mucous glands (of Brunner) in the duodenum	Exocrine pancreas	Salivary glands

Three basic mechanisms for releasing the product are commonly used by cells specialized for secretion, and cells engaged in each type of secretion can be distinguished histologically:

1. **Merocrine secretion**: This is the most common method of protein or glycoprotein secretion and involves typical exocytosis from membrane bound vesicles or secretory granules, most exocrine glands are merocrine.

2. Holocrine secretion: Here cells accumulate product continuously as they enlarge and undergo terminal differentiation, culminating in complete cell disruption that releases the product and cell debris into the gland's lumen. This is best seen in the sebaceous glands producing lipid rich material in skin.

3. Apocrine secretion: Here product accumulates at the cells' apical ends, portions of which are then extruded to release the product together with small amounts of cytoplasm and cell membrane. Lipid droplets are secreted in the mammary gland in this manner.


Secretory contents
Secretory vesicle
Nucleus
Secretory vesicles releasing their contents via exocytosis
(a) Merocrine gland
Disintegrating cells with contents becoming the secretion
Cells dividing
(b) Holocrine gland
Secretions
Nucleus of secretory cell
Pinching off of apical portion of secretory cell
(c) Apocrine gland

Renewal Of Epithelial Cells

Epithelial tissues are relatively labile structures whose cells are renewed continuously by:

- Mitotic activity
- Stem cell populations

The rate of renewal varies widely; it can be

- Fast in tissues such as the intestinal epithelium, which is replaced every week.
- Slow as in the large glands.

In stratified epithelial tissues, stem cells and mitosis occur only within the basal layer in contact with the basal lamina. In some functionally complex epithelia, stem cells are located only in restricted niches some distance from the transit amplifying cells and differentiating cells. For example, the epithelium lining the small intestine is derived completely from stem cells found in the simple glands between the intestinal villi. In the epidermis, many stem cells are located at a characteristic position along the wall of hair follicles.

THANK YOU