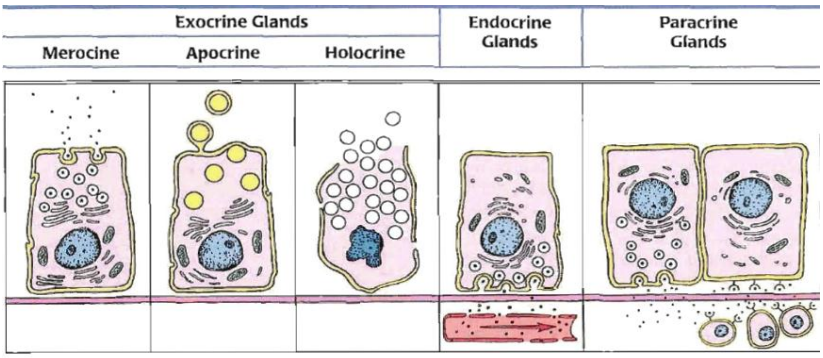
Lecture N0 – 2

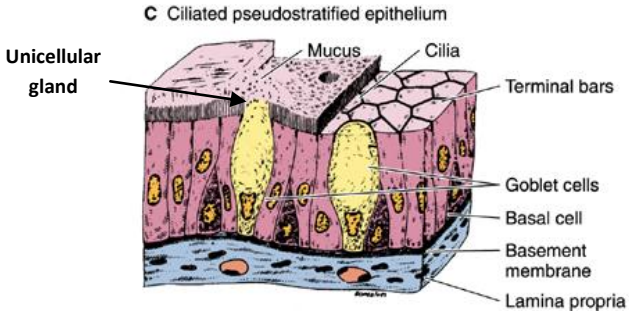


Glandular Epithelial Tissues

Glandular epithelia are 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 synthesize, store, and secrete proteins (eg, pancreas), lipids (eg, adrenal, sebaceous glands), or complexes of carbohydrates and proteins (eg, salivary glands). The mammary glands secrete all three substances. Less common are the cells of glands that have low synthesizing activity (eg, sweat glands) and that secrete mostly substances transferred from the blood to the lumen of the gland.

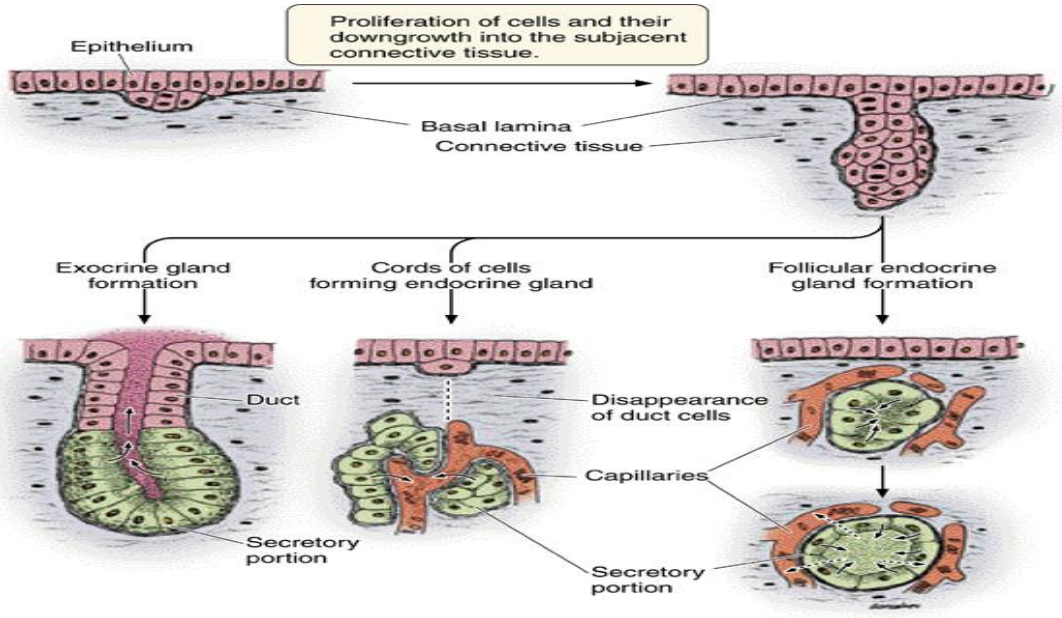
Types of Glands

The epithelia that form the glands of the body can be classified according to various criteria. **Unicellular glands** consist of isolated glandular cells, and **multicellular glands** are composed of clusters of cells. An example of a unicellular gland is the **goblet cell** of the lining of the small intestine , or of the respiratory tract. The term "gland," however, is usually used to designate large, complex aggregates of glandular epithelial cells, such as in the salivary glands and the pancreas.

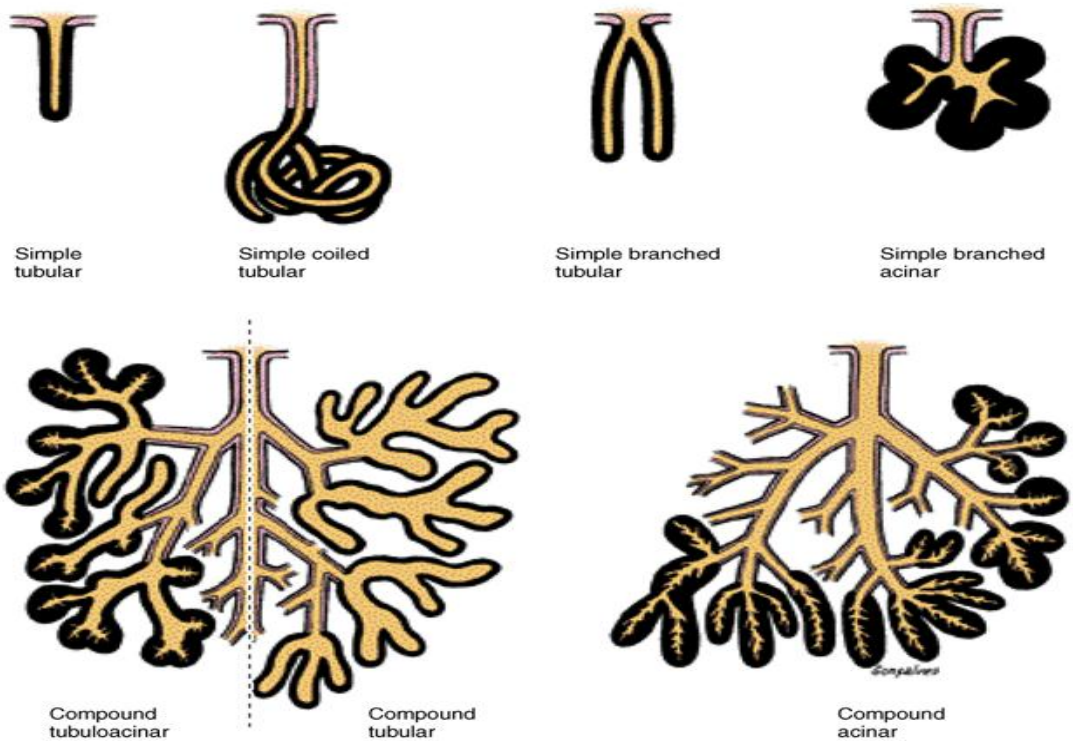


Glands arise during fetal life from covering epithelia by means of proliferation and invasion of the epithelial cells into the subjacent connective tissue, followed by further differentiation. **Exocrine** (Gr. *exo*, outside, + *krinein*, to separate) glands retain their connection with the surface epithelium from which they originated. This connection is transformed into tubular ducts lined with epithelial cells through which

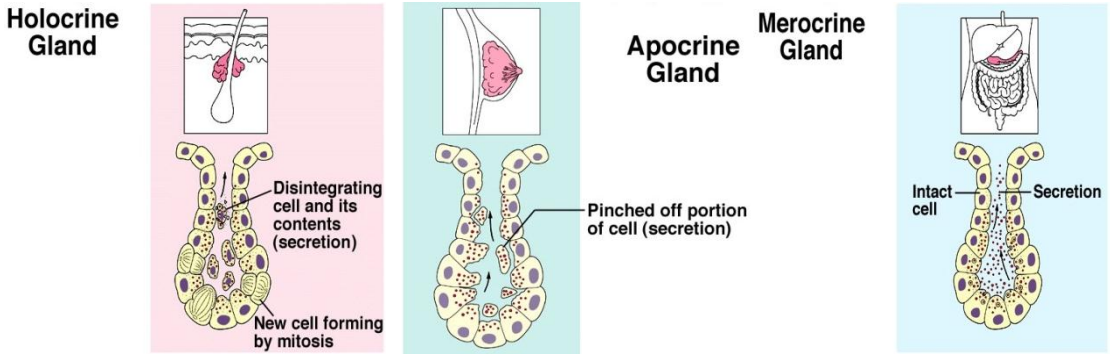
the glandular secretions pass to reach the surface. **Endocrine** (Gr. *endon,* within, + *krinein*) glands are glands whose connection with the surface is lost during development. These glands are therefore ductless, and their secretions are picked up and transported to their site of action by the bloodstream rather than by a duct system. Two types of endocrine glands can be recognized based on the arrangement of their cells. The endocrine cells may form anastomosing cords interspersed between dilated blood capillaries (eg, adrenal gland, parathyroid, anterior lobe of the pituitary; or they may arrange themselves as vesicles or follicles filled with noncellular material (eg, the thyroid gland).



Exocrine glands have a **secretory portion,** which contains the cells responsible for the secretory process, and **ducts,** which transport the secretions. **Simple glands** have only one unbranched duct, whereas **compound glands** have ducts that branch repeatedly. The cellular organization of the secretory portion differentiates the glands further. Simple glands can have their secretory portion in the form of a tubule, a coiled tubule, a branched tubule, or an acinus, in which the cells organize as spherical or globular units. Compound glands can be tubular, acinar, or tubuloacinar . Some organs have both endocrine and exocrine functions, and one cell type may function both ways—eg, in the liver, where cells that secrete bile into the duct system also secrete some of their products into the bloodstream. In other organs, some cells are specialized in exocrine secretion and others are specialized in endocrine secretion; in the pancreas, for example, the acinar cells secrete digestive enzymes into the intestinal lumen, whereas the islet cells secrete insulin and glucagon into the bloodstream.



Based on how the secretory products leave the cell, glands can be classified as **merocrine** (Gr. *meros*, part, + *krinein*) or **holocrine** (Gr. *holos*, whole, + *krinein*). In merocrine glands (eg, the pancreas), the secretory granules leave the cell by exocytosis with no loss of other cellular material. In holocrine glands (eg, sebaceous glands), the product of secretion is shed with the whole cell—a process that involves destruction of the secretion-filled cells. In an intermediate type—the **apocrine** (Gr. *apo*, away from, + *krinein*) gland—the secretory product is discharged together with parts of the apical cytoplasm .



Larger glands usually have a surrounding capsule of connective tissue and septa that divides the gland 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.

Control of Glandular Activity

Glands are usually sensitive to both neural and endocrine control. However, one form of control frequently dominates. For example, exocrine secretion in the pancreas depends mainly on stimulation by the hormones secretin and cholecystokinin (Gr. *chole,* bile, + *kystis,* bladder, + *kinein,* to move). In contrast, the salivary glands are principally under neural control.

The neural and endocrine control of glands occurs through the action of chemical substances called **chemical messengers.**