



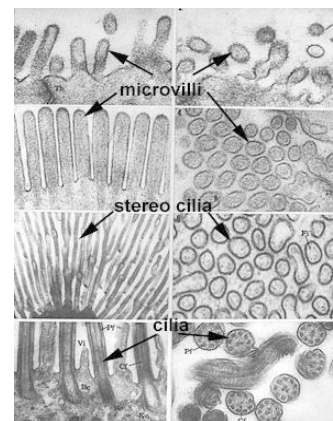
- What is the difference between cytology and histology?

- **Cytology:** it is the study of the structure and functions of cells and their contents.
- **Histology:** it is the study of the structure and function of tissues and organs at the microscopic levels. Notice that tissues are group of cells with similar structures and specific functions.

- There are four basic tissues which form all organs and systems of the body. Those are:

- **Epithelial tissue:**

- ✓ They are avascular (do not contain blood vessels) closely packed cells resting on a basement membrane which separates them from the vascular supporting tissue.
- ✓ They are continuously shed and being replaced by proliferation (mitosis) at basal stem cells.
- ✓ Epithelial surface specializations:

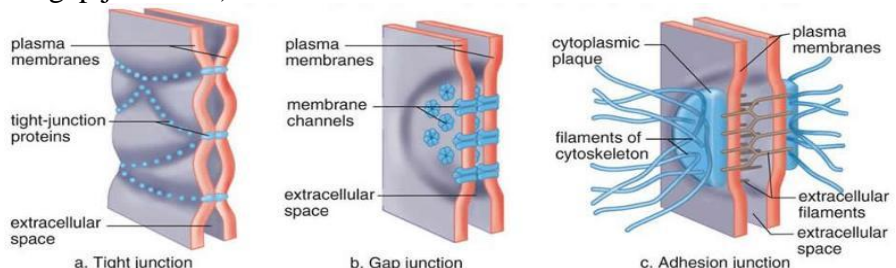


- ❖ *Apical:*

- Microvilli: increasing surface area of cells.
 - Cilia: motile surface projections involved in movement.
 - Stereocilia: long, non-motile microvilli.

- ❖ *Basal:* including basement membrane and hemidesmosomes.

- ❖ *Basolateral:* junctional complexes (tight, intermediate, desmosomes and gap junctions).



- ✓ There are two main types of epithelia:

- ❖ *Surface epithelia:* tightly packed cells forming a continuous layer covering the body surface or lining body cavities.
 - ❖ *Glandular epithelia:* secretory epithelial cells forming exocrine and endocrine glands.

- ✓ Classification of surface epithelia depends on:

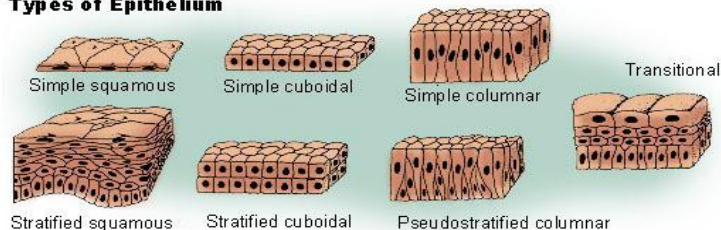
- ❖ *Number of cell layers:*

- Simple (one layer).
 - Stratified (more than one layer).
 - Pseudostratified (one layer but appears to be more than one).

- ❖ *Shape of cell layers:*

- Squamous (flat nucleus).
 - Cuboidal (round nucleus).
 - Columnar (oval nucleus).

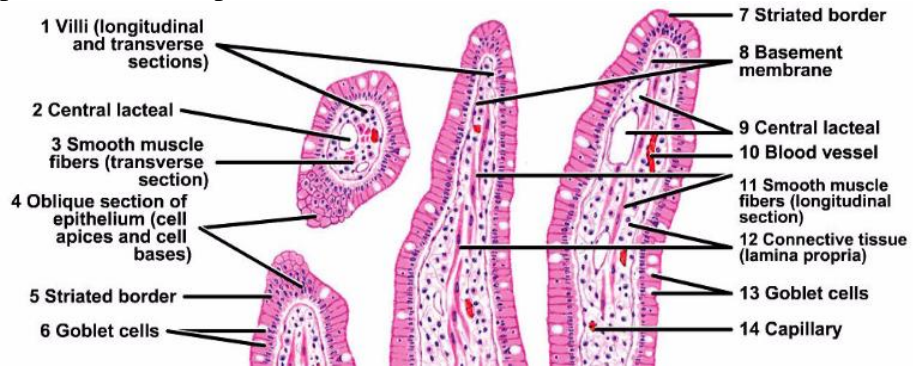
Types of Epithelium



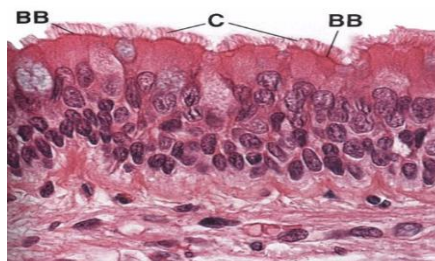


✓ Functions and locations of surface epithelia:

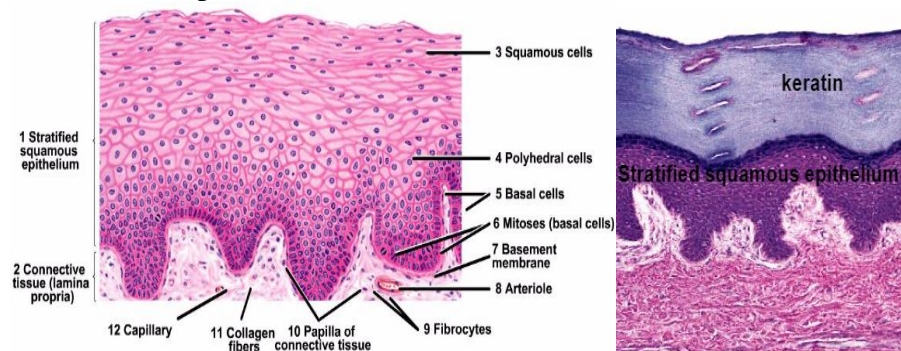
- ❖ *Simple squamous epithelium*: it is located in blood vessels and heart (endothelium); forming serous membranes of pleura, pericardium, peritoneum and Bowman's capsule of the kidney. It functions in filtration, diffusion and secretion.
- ❖ *Simple cuboidal epithelium*: it is located in thyroid gland, ducts of many glands and kidney tubules. It function in covering, secretion and absorption.
- ❖ *Simple columnar epithelium*: it is located in stomach, small intestine, large intestine, gallbladder, uterus and uterine tubes. It functions in protection, absorption and secretion.



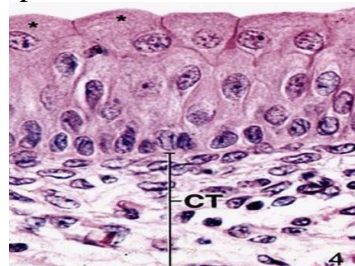
- ❖ *Pseudostratified columnar ciliated epithelium with goblet cells*: it lines the respiratory passages and functions in protection, secretion and transport.



- ❖ *Stratified squamous non-keratinized (moist)*: it is found in mouth, esophagus, anus, vagina and cornea. It functions in protection and secretion.
- ❖ *Stratified squamous keratinized epithelium*: it is found in the epidermis of the skin for protection.



- ❖ *Transitional epithelium*: it is found in urinary tract (bladder and ureter). It functions in protection and distention.



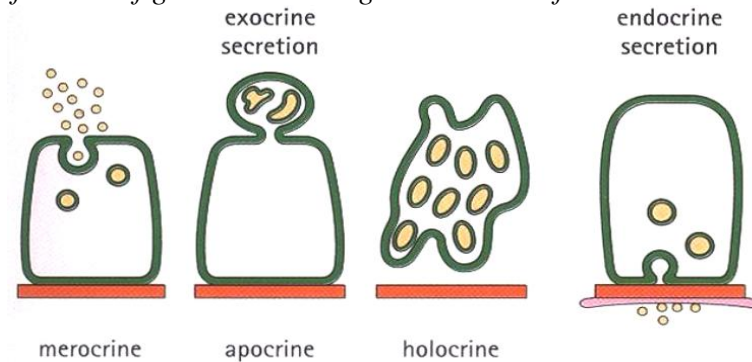


✓ Glandular epithelia:

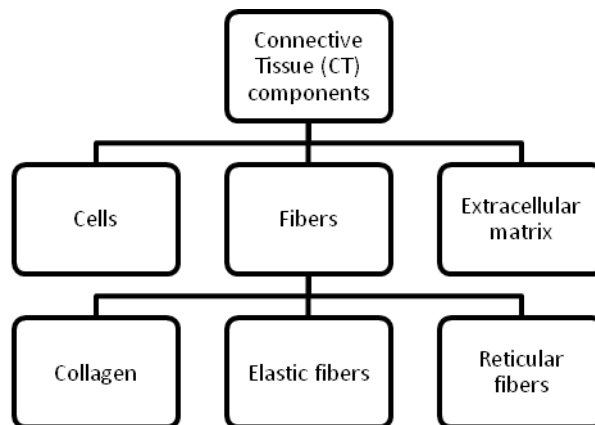
❖ *There are two main types:*

- Exocrine: transport their secretion by ducts.
- Endocrine: release their secretion directly in the blood stream (i.e. ductless).

❖ *Classification of glands according to the mode of secretion:*



• **Connective tissue (it supports and connects tissues and organs):**



✓ Extracellular matrix:

- ❖ It is mainly composed of proteins and glycosaminoglycans.
- ❖ *The three fibrillar components are:*
 - Collagen (tensile support).
 - Elastic (stretchable fiber).
 - Reticular fibers = type-III collagen.

✓ Connective tissue cells:

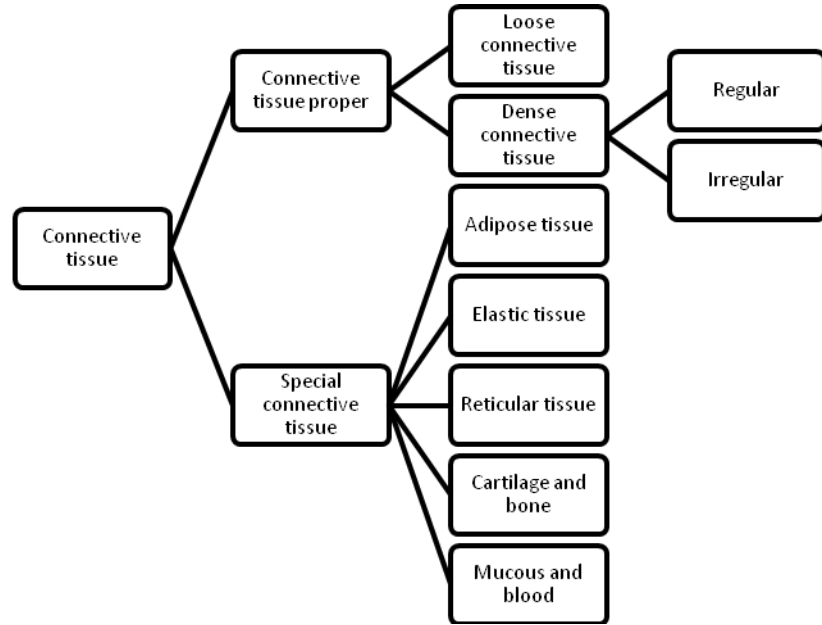
- ❖ *Fibroblast/fibrocyte:* synthesizing fibers and extracellular matrix.
- ❖ *Adipocyte:* signet-ring appearance; stores fat.
- ❖ *Mast cell:* filled with basophilic granules; increased with allergy.
- ❖ *Macrophage:* derived from blood monocytes; phagocytosis and defense.
- ❖ *Plasma cells:* arising from B-lymphocytes.
- ❖ *Leukocytes:* neutrophils (defense against bacterial invasion); eosinophils (allergy).
- ❖ *Lymphocytes.*

✓ Fibers of connective tissue:

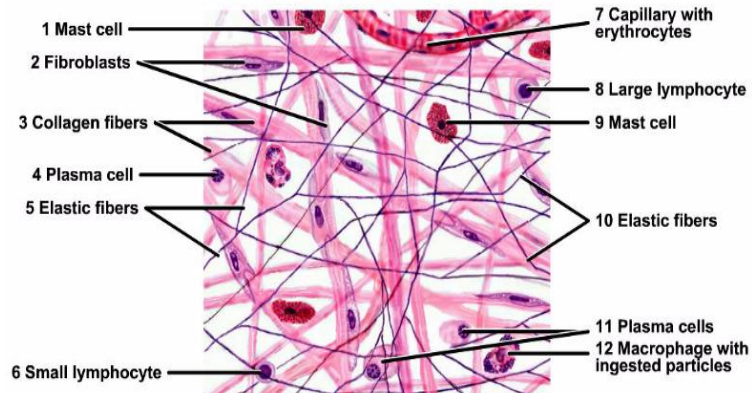
- ❖ *Collagen fibers:* tough, thick, fibrous, do not branch and most abundant. There are many types of collagen fibers:
 - Type-I: dermis of skin, tendons and bone.
 - Type-II: hyaline cartilage and elastic cartilage.
 - Type-III: reticular fibers.
 - Type-IV: basal lamina of basement membrane.



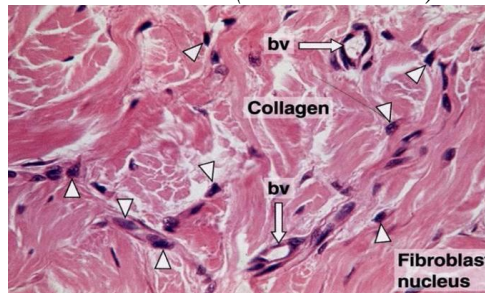
- ❖ *Elastic fibers*: thin, small, branching and containing elastin. They are stretchable (responsible for elastic recoil) and are present in lungs, urinary bladder, skin and large blood vessels.
- ❖ *Reticular fibers*: they form a delicate network in lymph nodes, spleen, bone marrow, lungs and liver. They are detected if the tissue is stained with silver stain.



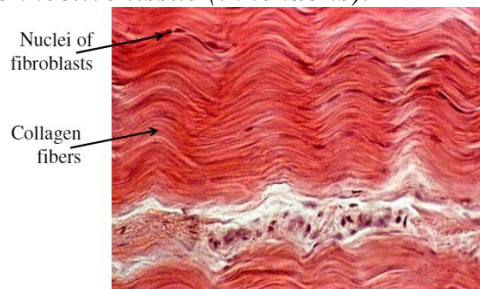
❖ *Loose connective tissue:*



❖ *Dense irregular connective tissue (in skin dermis):*

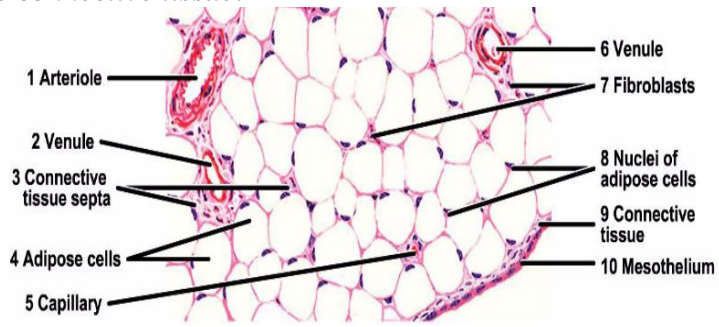


❖ *Dense regular connective tissue (in tendons):*

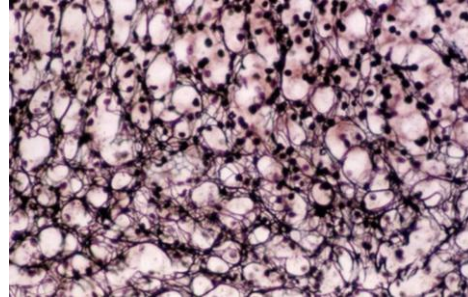




❖ *Adipose connective tissue:*



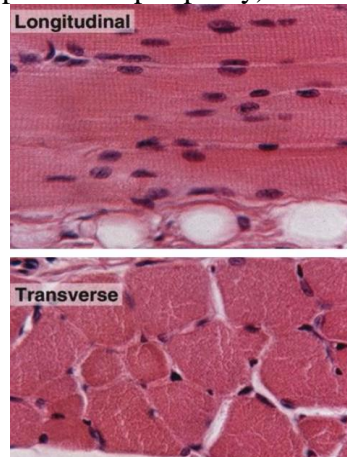
❖ *Reticular connective tissue:*



• **Muscle tissue:**

✓ It is contractile tissue responsible for movement. There are three types of muscle tissue:

❖ *Skeletal (striated)*: voluntary, quick, forceful, cylindrical, multi-nucleated (nuclei are present at periphery).



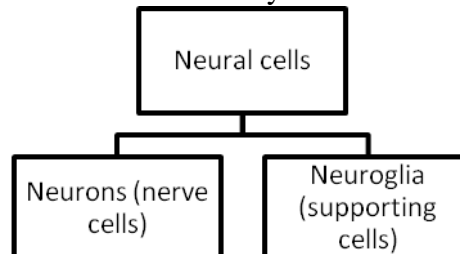
❖ *Smooth (unstriated)*: involuntary and slow.

❖ *Cardiac (striated and branched)*: involuntary and rhythmic.

• **Nervous tissue:**

✓ Forming central and peripheral nervous systems.

✓ It is highly excitable and conductive of signals, integrating them and creating appropriate responses that control all body activities.



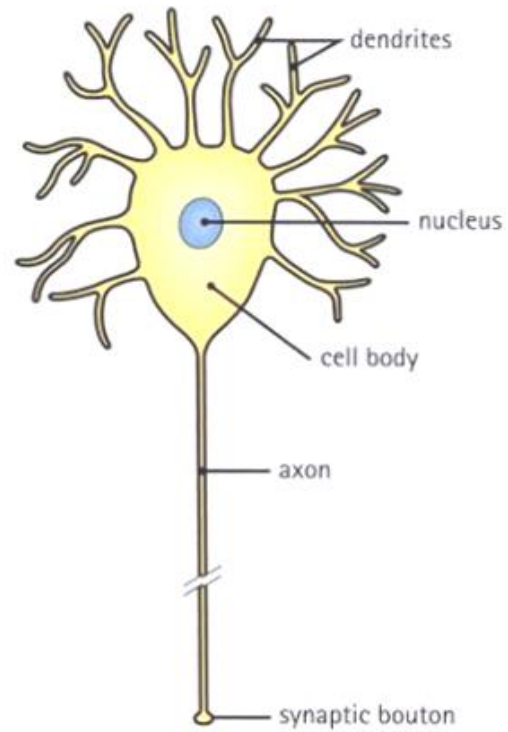
✓ Neurons:

❖ They are responsible for reception, transmission and processing of stimuli and responses.

❖ Each neuron consists of a cell body (soma), dendrites and an axon.

❖ Neurons can be: sensory or motor; voluntary or involuntary.

- ❖ Axons can be: myelinated (for fast conduction) or unmyelinated (for slow conduction).



- ✓ Neuroglia are classified into five types:
 - ❖ *Astrocytes*: Blood-Brain Barrier (BBB).
 - ❖ *Oligodendrocytes*: myelin in the CNS.
 - ❖ *Schwann cells*: in peripheral nervous system (PNS).
 - ❖ *Microglia*: phagocytic cells (for defense).
 - ❖ *Ependyma*: Secrete cerebrospinal fluid (CSF).