

THE TISSUES

A tissue is composed of specialized cells of the same type that perform a common function in the body. The tissues of the human body can be categorized into four major types:

- 1- Epithelial tissue covers body surface and lines body cavities.
- 2- Connective tissue binds and supports body parts.
- 3- Muscular tissue moves the body and its parts.
- 4- Nervous tissue receives stimuli and conducts nerve impulses.

Epithelium Tissues

- Epithelial tissues consists of tightly packed cells that form a continuous layer.
- The unique feature of the epithelial tissues is its highly cellular composition with little extracellular matrix (ECM).
- This tissue rest on top of the basement membrane, which separates epithelia from underlying connective tissues.

The principal functions of epithelial :

- Covering, lining, and protecting surfaces (eg, epidermis).
- Absorption (eg, the intestinal lining).
- Secretion (eg, epithelial cells of glands).

TYPES OF EPITHELIA

Epithelia can be divided into two main groups according to their structure and function:

- 1- **Covering (or lining) epithelia .**
- 2- **Secretory (glandular) epithelia.**

Covering or Lining Epithelia

Cells are organized in layers that cover the external surface or line the cavities of the body.

They are classified according to the **number of cell layers**:

- Simple epithelia contain one cell layer.
- Stratified epithelia contain two or more layers.

A- simple epithelium

- Is a single layer of cells.
- It is found where absorption and filtration occur.
- The thinness of the epithelial barrier facilitates these processes.

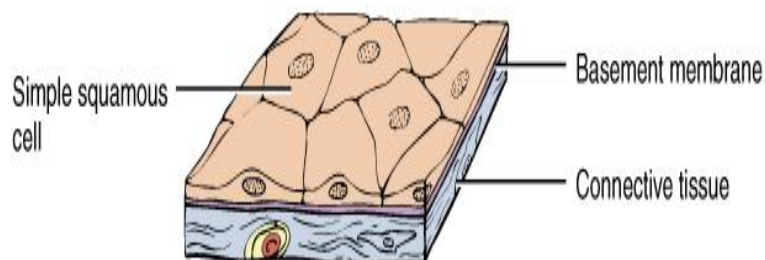
Based on cell shape, **simple epithelia** are classified as:

1-Simple Squamous epithelium :

Description: Singal layer of flattened cells with disc- shaped central nuclei. Cells in direct contact with each other

Function: Passive transport of gases and fluids. Its shape and arrangement permit exchanges of substances in this location.

Loacation: the alveoli of lungs, lines body cavities (mesothelium)and blood vessels (endothelium).

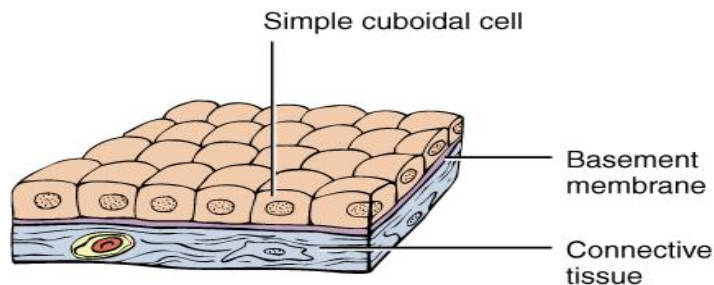


2- Simple Cuboidal

Description: Single layer of cube-shaped cells , nuclei round and centrally located.

Function: Absorption , secretion or excretory .

Location: small collecting ducts of kidney, pancreas, and salivary gland.



3-Simple Columnar epithelium

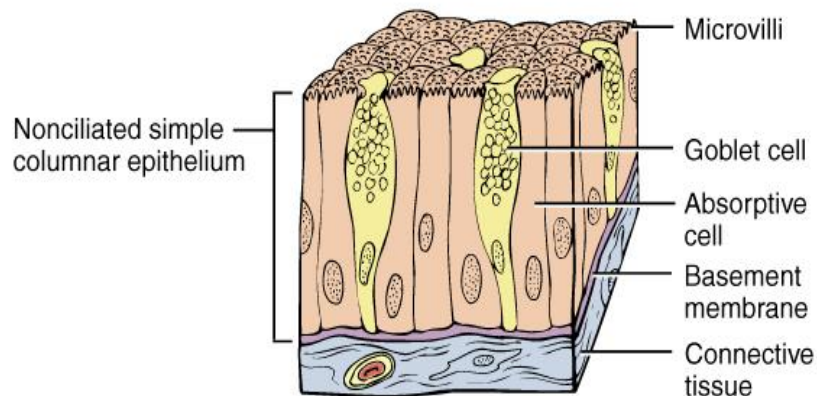
Description: Single layer rectangular cells, with nuclei located near the bottom of each cell.

can be ciliated or non-ciliated; Some tissues contain goblet cells.

- Unicellular glands (goblet cells secrete mucus) for lubricate GI
- Microvilli (fingerlike cytoplasmic projections) ,expand the surface area for absorption in GI tract

Location: Ciliated columnar epithelium is found lining the oviaducts.

Non-ciliated epithelium can also possess microvilli, is found lining digestive tract.



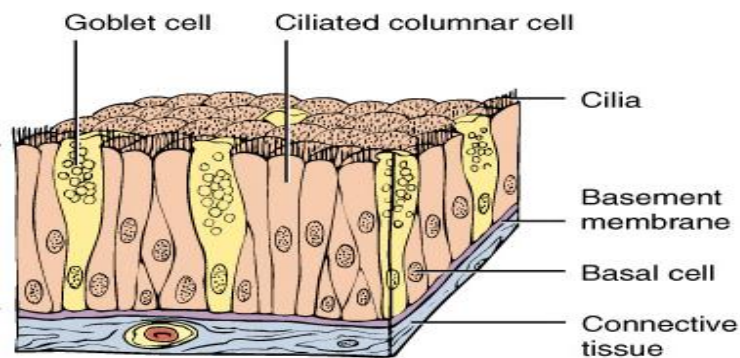
4-pseudostratified columnar epithelium:

Description

- Single cell layer, tall, irregular cells
- All cells attach to basement membrane but not all reach free surface
- Nuclei at different level, giving a stratified appearance

Function: Protection, secretion; cilia-mediated transport of particles trapped in mucus out of the air passages.

location: Lining the upper respiratory tract, where the cells are also heavily ciliated.



B- Stratified epithelia

Is multilayered, therefore found where body linings have to withstand mechanical or chemical insult.

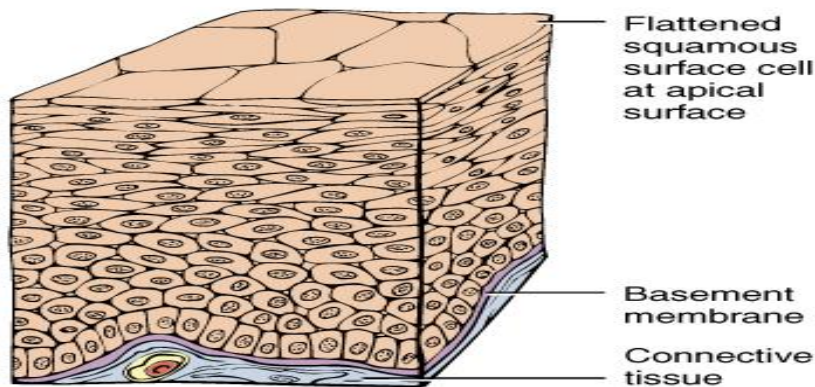
Most stratified epithelia are classified according to the **cell shape of the superficial layer(s):**

1. Stratified squamous epithelia

Description: Several cell layers thick, surface cells flat and can be:

- **Keratinized** = surface cells dead and filled with keratin such as skin (epidermis)
- **Nonkeratinized** = no keratin in moist living cells at surface, lines wet cavities (eg, mouth and esophagus).

Function: Protection; prevents water loss.



2-Stratified cuboidal is restricted to excretory ducts of salivary and sweat glands.

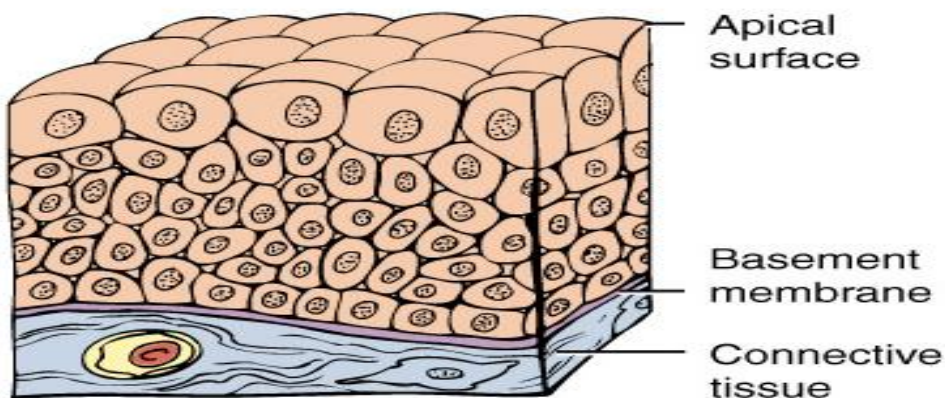
3- Stratified columnar epithelia can be found in the conjunctiva lining the eyelids.

Transitional epithelium or urothelium

Description: Multilayered , superficial layer are large, dome-like cells sometimes called umbrella cells .

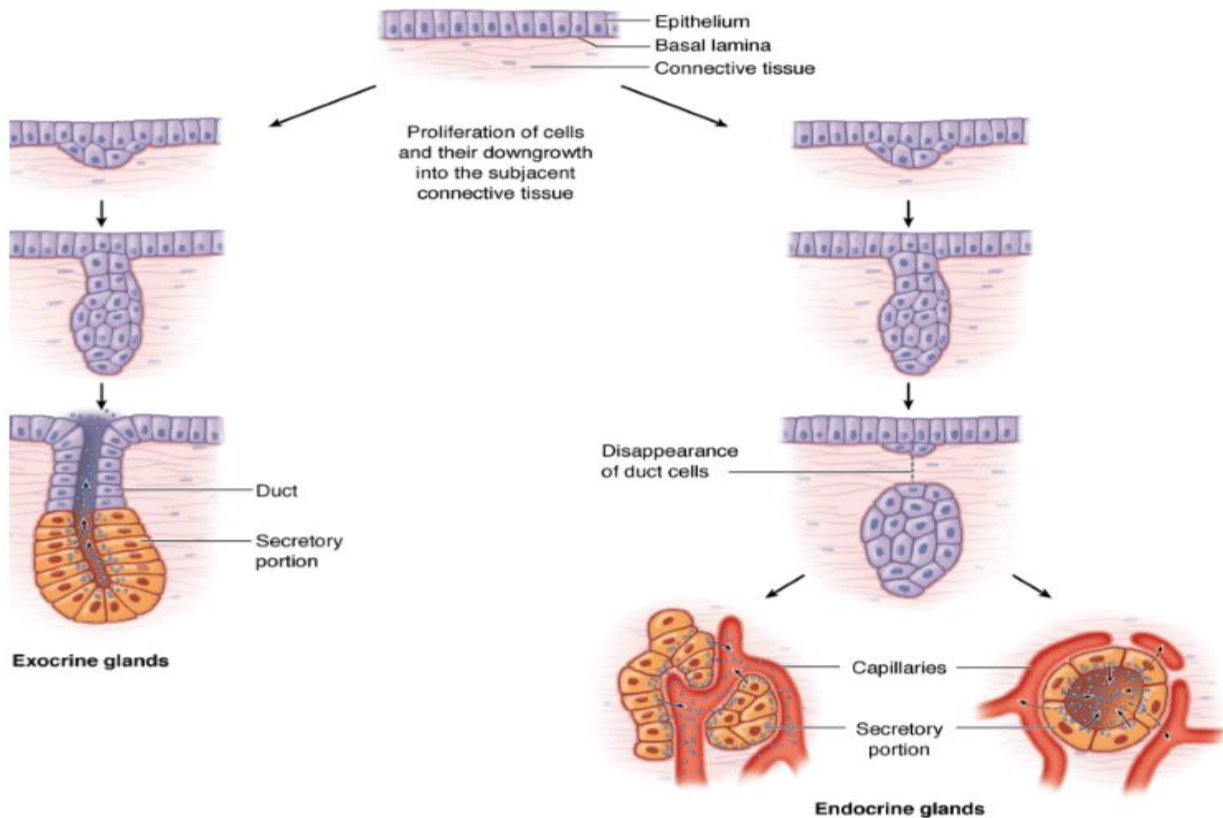
Function: These cells are specialized to protect underlying tissues from the hypertonic and potentially cytotoxic effects of urine.

Location: lines only the urinary bladder, the ureter, and the upper part of the urethra.



2- Secretory (glandular) epithelia.

- Glandular tissue is the type of epithelium that forms the glands.
- Glandular epithelia are formed by cells specialized to secrete.
- Glands develop from covering epithelia during fetal life by means of cell proliferation and growth into the underlying connective tissue, followed by further differentiation .



There are two major classifications of glands:

- 1- Exocrine glands** retain their connection with the surface epithelium, the connection forming the tubular ducts lined with epithelium by which secreted material leaves the gland.
- 2- Endocrine glands** lose the connection to their original epithelium and therefore lack ducts. Thin-walled blood vessels (capillaries) adjacent to the endocrine cells absorb their secreted hormone products for transport in blood to target cells throughout the body.

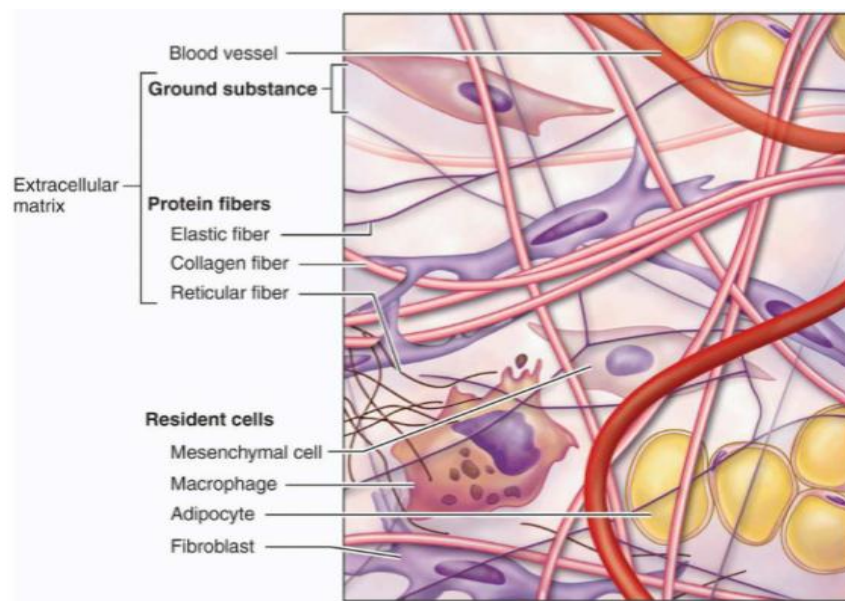
In both exocrine and endocrine glands the secretory units are supported by a stroma of connective tissue.

Connective tissue

- The tissues that connect the different parts of the body together called connective tissues.
- Structurally it is made up of cells and large amount of intercellular space containing extracellular matrix (fibers & ground substance).
- The ground substance acts as a fluid matrix that suspends the cells and fibers within the particular connective tissue type.
- The cells scattered throughout an extracellular matrix .
- Connective tissue fibers and matrix are synthesized by specialized cells called fibroblasts.
- All adult connective tissues are derived from an embryonic form of connective tissue called mesenchyme, which contains uniformly undifferentiated cells called mesenchymal cell.

Functions of connective tissue

- support and binding of other tissues.
- defending the body against infections: macrophages , mast cell , plasma cells, WBCs
- storing nutrients as fat.



Connective Tissue Fibers

Connective tissue fibers are long , slender protein polymers that are present in variable proportions in different types of connective tissue.

Three main types of loose connective fibers include:

1- Collagenous fibers

- (25% of protein in your body)
- tough, resistant to pull
- formed from the protein collagen.
- These fibers help to strengthen connective tissue.

2- Elastic fibers

- (lungs, blood vessels, ear cartilage)
- Smaller diameter fibers formed from protein elastin surrounded by glycoprotein.
- They help to give connective tissue elasticity.

3- Reticular fibers

- (liver, spleen, lymph nodes, and bone marrow).
- Thin , branched fibers that form framework of organs.
- Formed from collagen III.
- Join connective tissues to other tissues.

These fibers are distributed unequally among the types of connective tissue and the predominant fiber type is usually responsible for conferring specific properties on the tissue.

Connective Tissue Types

There are three main groups of connective tissues:

- Loose connective tissue holds organs in place and attaches epithelial tissue to other underlying tissues.
- Dense connective tissue helps attach muscles to bones and link bones together at joints.
- Specialized connective tissue encompasses a number of different tissues with specialized cells and unique ground substances. Some are solid and strong, while others are fluid and flexible. Examples include adipose, cartilage, bone, blood, and lymph.

Loose Connective Tissue

Loose connective tissues provide support, flexibility, and strength required to support internal organs and structures.

It usually supports epithelial tissue, forms a layer around small blood and lymphatic vessels, and fills the spaces between muscle and nerve fibers. Is a very common type of connective tissue.

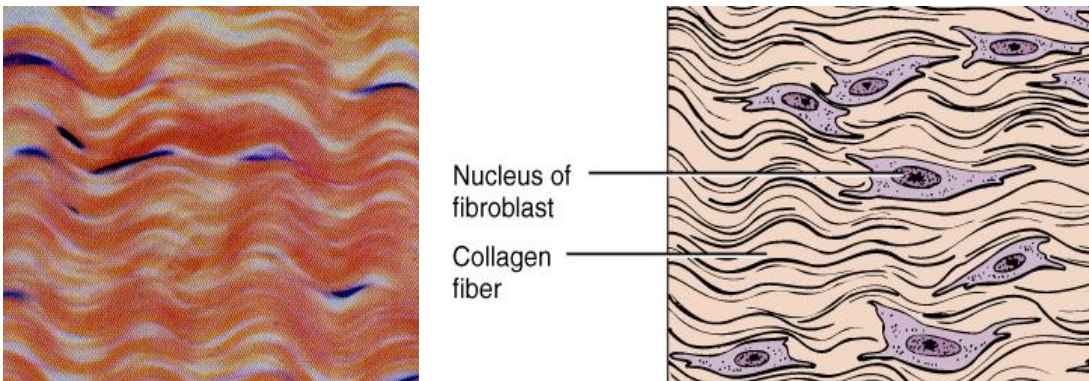
Loose connective tissue, sometimes called areolar tissue, has all the main components of connective tissue (cells, fibers, and ground substance) in roughly equal parts.

Dense Connective Tissue

Dense connective tissue or fibrous connective tissue is composed of large amounts of closely packed collagenous fibers. It is thicker and stronger than loose connective tissue and forms a protective capsule layer around organs such as the liver and kidneys. Dense connective tissue can be categorized into:

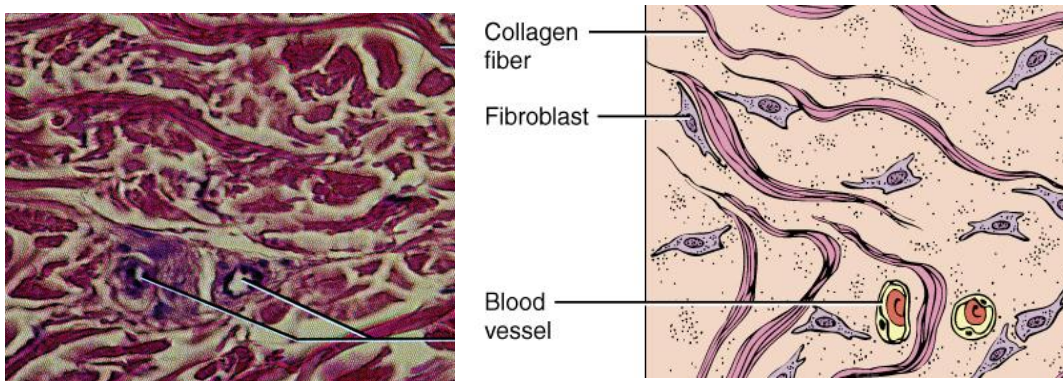
- Dense regular connective tissues.
- Dense irregular connective tissues.
- **Dense regular:**
 - Collagen fibers in parallel bundles with fibroblasts between bundles of collagen fibers, creating very strong cords.

- White, tough and pliable (forms tendons) .
- Also known as white fibrous connective tissue.



- **Dense irregular:**

- Collagen fibers are irregularly arranged (interwoven)
- Tissue can resist tension from any direction.
- Very tough tissue (white of eyeball, dermis of skin)
- Dense irregular connective tissue is often found closely associated with loose connective tissue.



- **Reticular Tissue**

- This specialized connective tissue consists of reticular fibers of type III collagen produced by specialized fibroblasts called reticular cells.
- Network of fibers & cells that produce framework of organ.
- Holds organ together (liver, spleen, lymph nodes, bone marrow).