

## 1. Overview of Tissue Types

The human body consists of four primary tissue types:

**Muscle Tissue:** Includes cardiac, skeletal, and smooth muscles.

**Nerve Tissue:** Composed of the brain, spinal cord, and nerves.

**Epithelial Tissue:** Covers body surfaces and lines hollow organs.

**Connective Tissue:** Includes bone, fat, blood, and tendons.

## 2. Epithelial Tissue

### General Characteristics:

**Location:** Covers body surfaces, lines the gastrointestinal tract, and forms glands.

**Structure:** Cells are tightly packed with very little extracellular matrix (ECM). They rest on a basement membrane composed of fibers (collagen) and polysaccharides, which aids in filtration and gas exchange.

**Polarity:** Cells have an apical surface (top), lateral surface (sides), and a basal surface (bottom attached to the basement membrane).

### Classification:

Epithelium is classified by cell layers and shape:

#### Simple Epithelium (Single Layer):

**Simple Squamous:** Flat cells found in lung air sacs and blood vessels; allows for nutrient and gas exchange.

**Simple Cuboidal:** Cube-shaped cells found in kidney tubules and thyroid follicles; involved in secretion and reabsorption.

**Simple Columnar:** Tall cells lining the stomach and intestines; nucleus located near the base.



## Stratified Epithelium (Multiple Layers):

Found where protection is needed, such as the skin, esophagus, and vagina.

Types include stratified squamous, stratified cuboidal, stratified columnar, and transitional.

## Surface Modifications:

**Microvilli:** Finger-like projections on the apical surface that increase surface area for absorption

(found in the small intestine and kidney).

**Cilia:** Rod-like structures that beat in coordination to move substances, such as mucus in the respiratory tract.

## Cell Junctions:

**Tight Junctions:** Create watertight seals to prevent leakage between cells.

**Desmosomes:** Provide mechanical stability and adhesion.

**Gap Junctions:** Channels that allow the transport of ions and small molecules between cells.

**Hemidesmosomes:** Anchor cells to the basal lamina.



### 3. Connective Tissue

#### General Characteristics:

**Composition:** Contains cells and a significant amount of ECM (which can be fluid, gel-like, or solid) containing fibers.

**Functions:** Transport, storage, structural support, protection, and cushioning organs.

#### Types of Connective Tissue:

##### Fluid Connective Tissue (Blood):

Composed of plasma (55%) and formed elements (45%), including red blood cells, white blood cells, and platelets. Transports nutrients and gases and maintains body temperature.

##### Loose Connective Tissue:

**Areolar:** The most widely distributed; holds organs in place and contains few fibers.

**Adipose:** Contains adipocytes with large vacuoles to store fat; functions in energy storage and insulation.

##### Dense Connective Tissue:

Contains many fibers and few cells; found in fibrous capsules of organs.

**Tendons:** Connect muscle to bone.

**Ligaments:** Connect bone to bone at joints.

##### Supportive Connective Tissue:

**Cartilage:** Composed of chondrocytes in a jelly-like ECM; found in the nose, ears, and between ribs.

**Bone:** Composed of cells in a solid ECM rich in minerals like calcium.

##### Bone Cells:

**Osteoblasts:** Bone-forming cells.

**Osteocytes:** Mature bone cells embedded in the matrix.

**Osteoclasts:** Multinucleated cells responsible for bone resorption (breaking down bone).

**Bone Lining Cells:** Regulate mineral exchange.