

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.