Animal Histology:
Cells and Tissues

Tissues

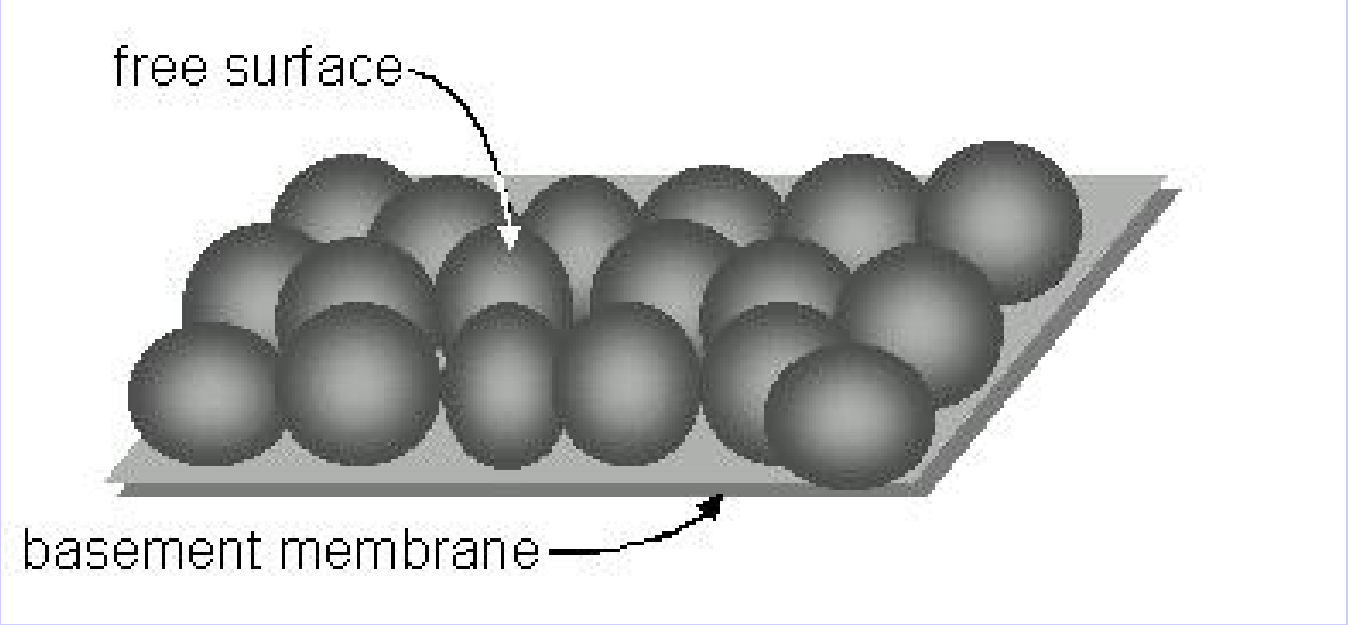
- How do we define ***tissue***?
- Tissues are groups of specialized cells that work together for a particular function.
- There are four types of tissue.
    - **Epithelial** (covering)
    - **Connective** (support)
    - **Muscle** (movement)
    - **Nervous** (control)

1. Epithelial Tissues

- Epithelial tissue is made of closely-packed cells arranged in flat sheets.

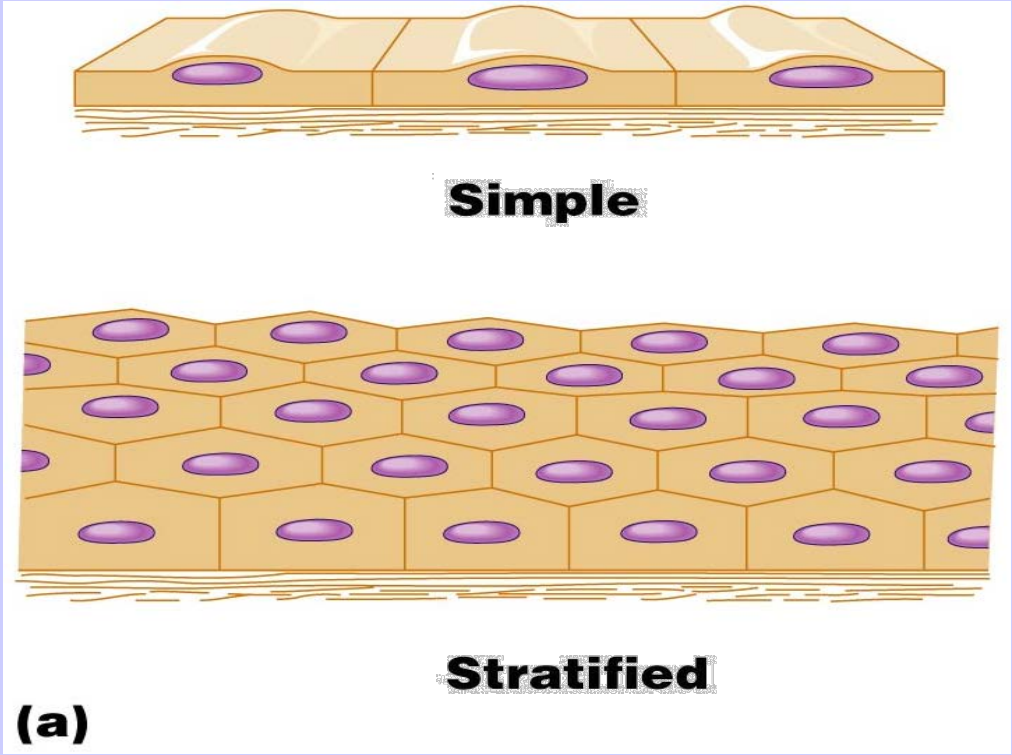
- Epithelia form the surface of the skin, line the various cavities and tubes of the body, and cover the internal organs.

- One surface of the tissue is free and the other adheres to a basement membrane.



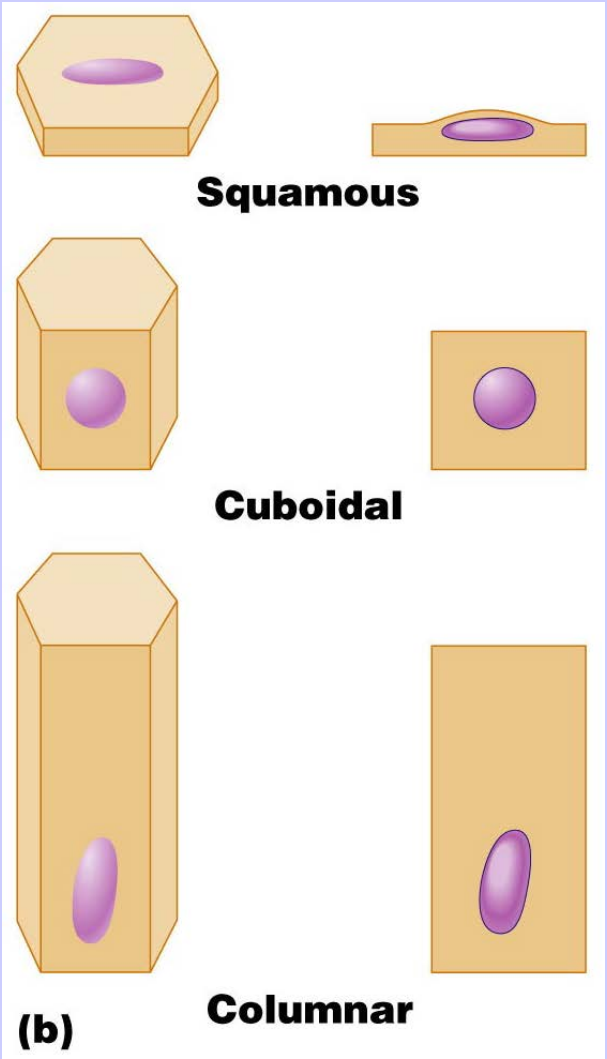
Classification of Epithelium

- Each epithelium is given 2 names
- *First*: indicates relative number of cell layers
  - **Simple** (one layer of cells)
  - **Stratified** (more than one cell layer)



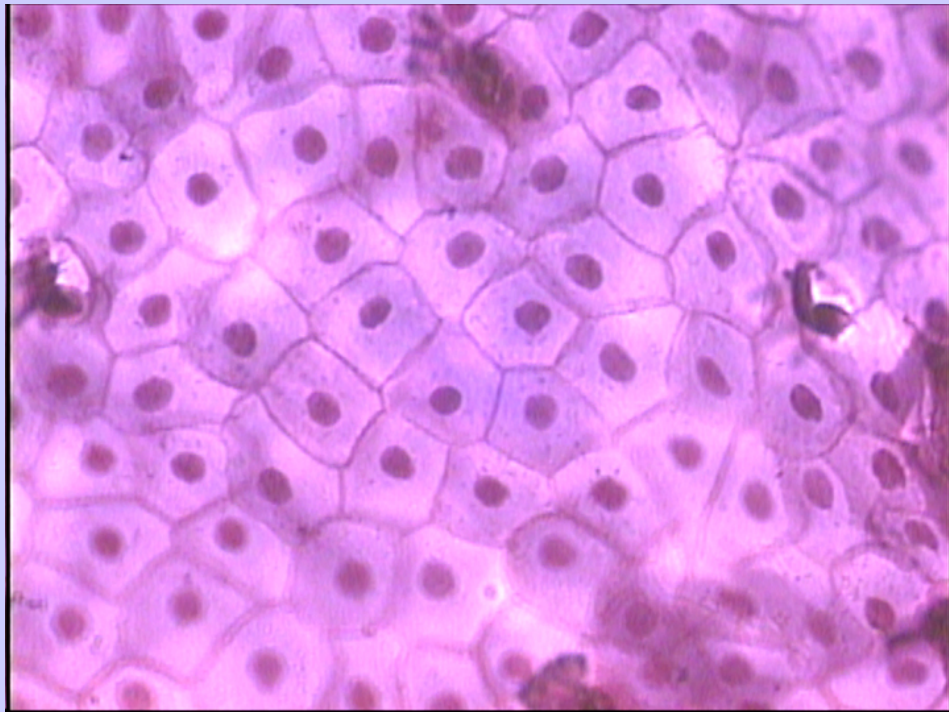
Classification of Epithelium

- *Second*: describes the shape of cells
  - **Squamous** (cells flattened like scales)
  - **Cuboidal** (cube-shaped)
  - **Columnar** (shaped like columns)



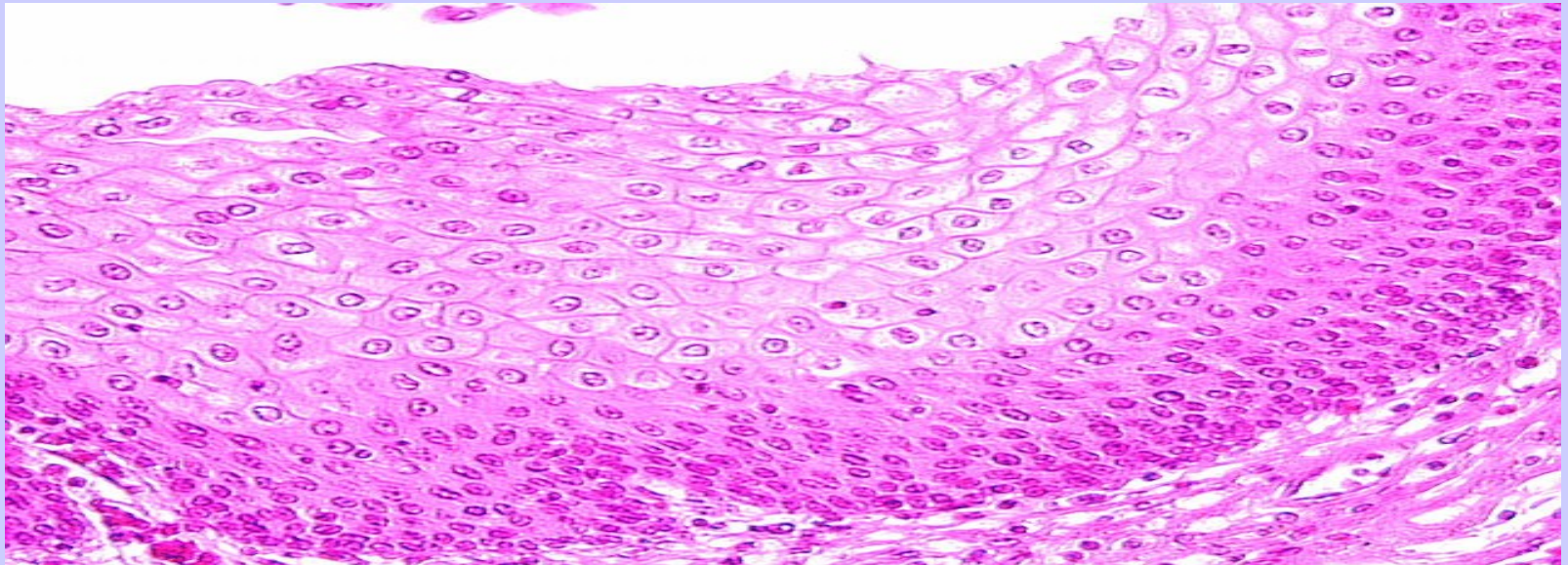
Simple Squamous Epithelium

- Simple squamous (SS) tissue is composed of flat, scale-like cells that usually forms membranes
- It lines the walls of blood vessels, pulmonary alveoli (shown here), and the lining of the heart, lung.



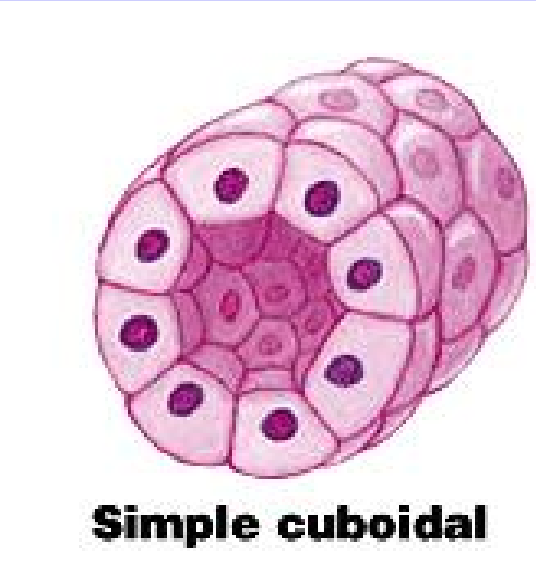
Stratified Squamous Epithelium

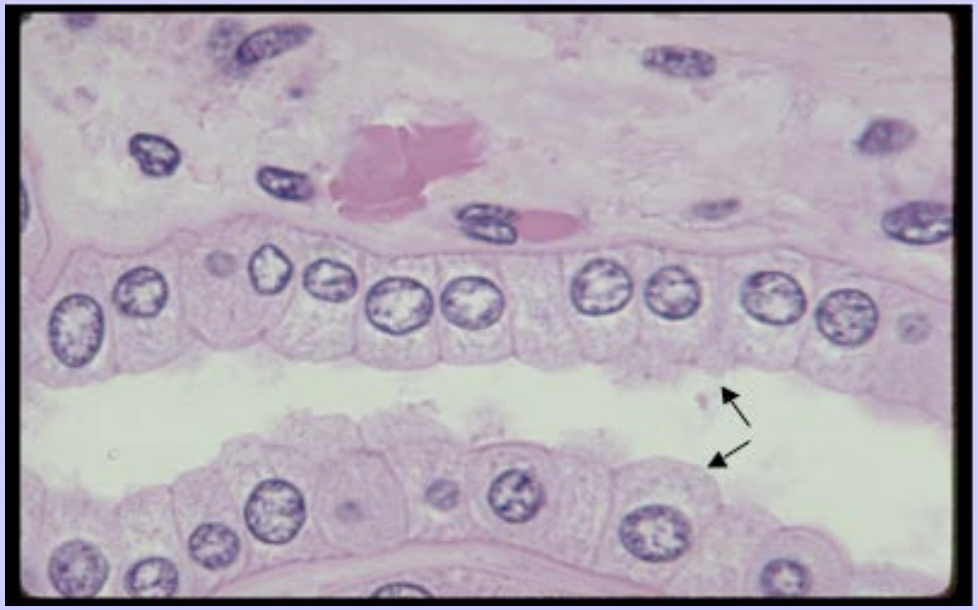
- The term “stratified” refers to the layered arrangement of cells.
- The outer layers of cells appear flat, but the inner cells vary in shape from cuboidal to columnar.
- Stratified squamous epithelium serves as a barrier to the outside environment in locations such as the skin, mouth, and esophagus.



Simple Cuboidal Epithelium

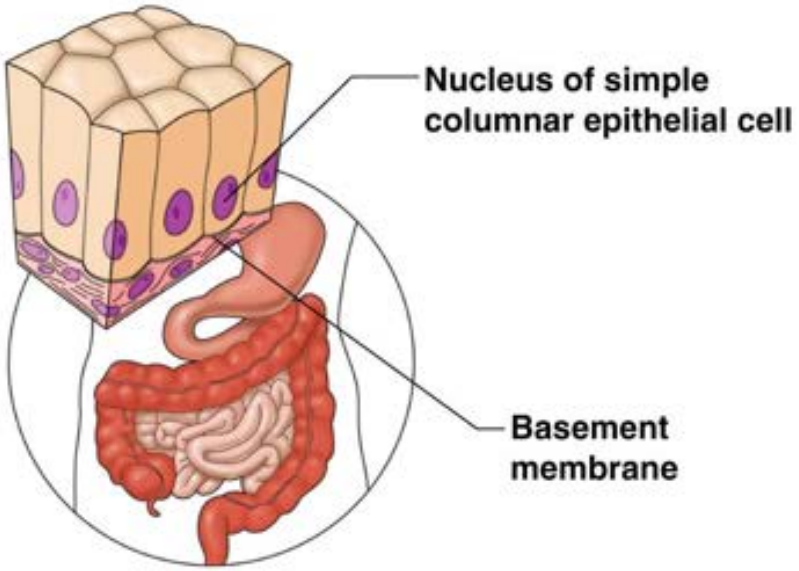
- This tissue is composed of a single layer of cube-like cells.
- It lines the walls of kidney tubules, covers the surface of ovaries, and is common in glands and their ducts.



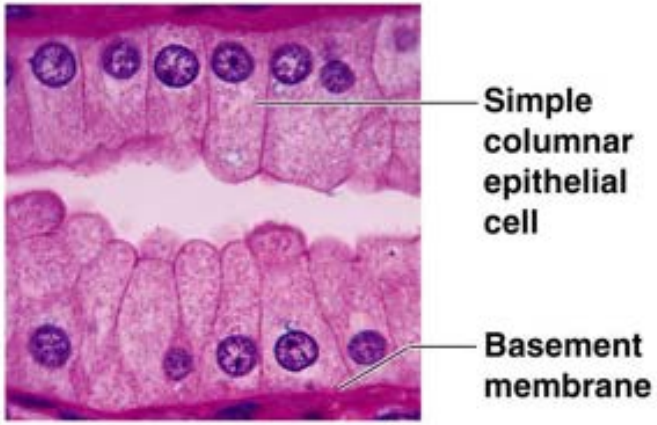


Simple Columnar Epithelium

- This tissue is composed of a single layer of tall cells.
- It often includes mucus-producing **goblet cells**.
- It often lines the digestive tract.



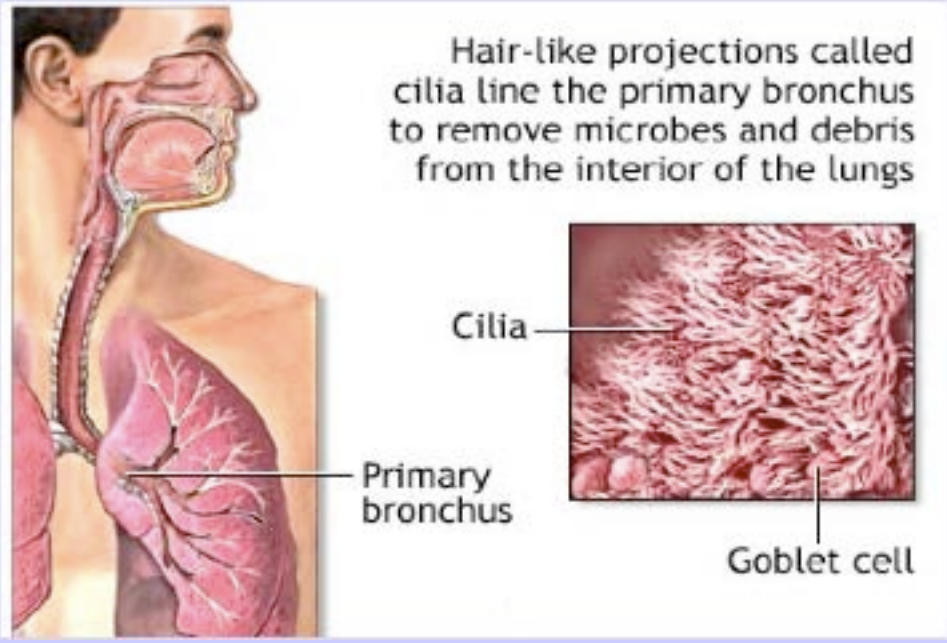
(c) Diagram: Simple columnar



Photomicrograph: Simple columnar epithelium of the stomach lining (900x).

Ciliated Epithelium

- Some epithelial membranes are made up of cells with cilia, tiny projections that beat in harmony to move mucus along the surface.
- Ciliated epithelia in the trachea, for example, sweep debris out of the respiratory tract.



2. Connective Tissue

- The cells of connective tissue are embedded in a great amount of extracellular material. This **matrix** is secreted by the cells.

Connective Tissue

- Connective tissues function to
  - bind other tissues together
  - provide support
  - provide nourishment
  - store wastes
  - repair damaged tissues

Types of Connective Tissue

A. Proper connective tissue

- **(Dense) Binding connective tissue:**
- Tendons: connect muscle to bone.
- Ligaments: attach one bone to another.
- Fibrous.
- **Loose connective tissue**
- Areolar
- Adipose

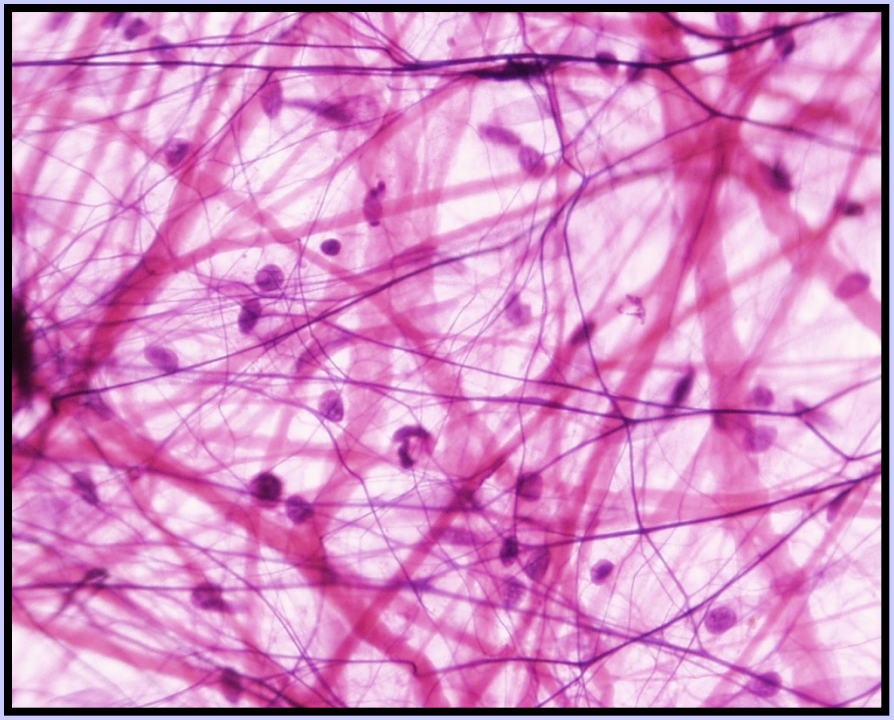
B. Liquid connective tissues: Blood, Lymph

C. Cartilage

D. Bone

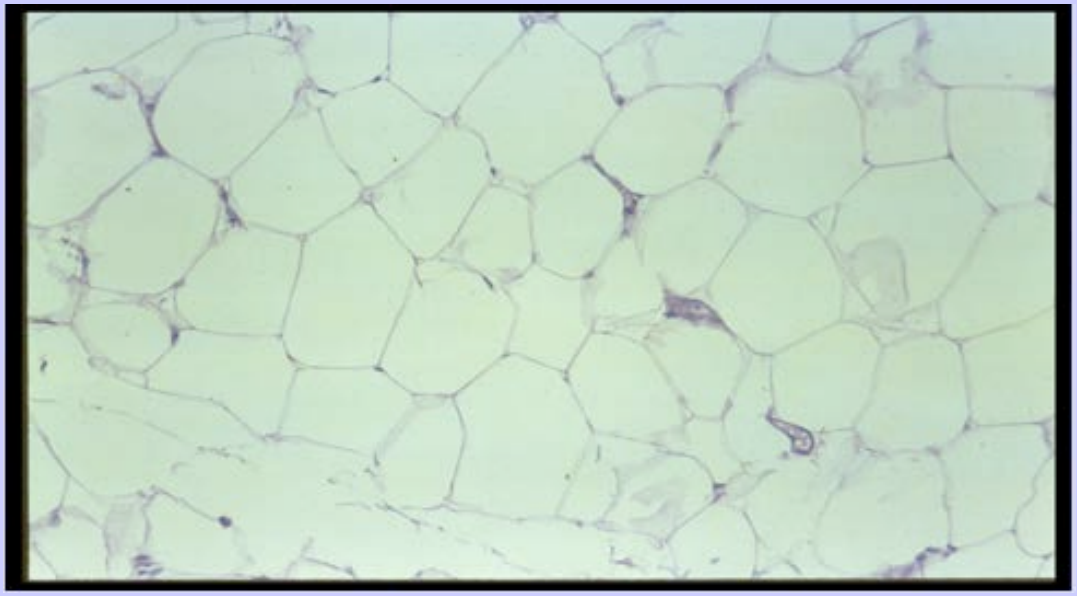
Areolar Tissue

- Most widely distributed connective tissue
- Soft tissue that cushions and protects the body's organs it wraps
- Holds internal organs together and in their proper positions
- Under microscope: matrix appears as empty space, reservoir of water and salts



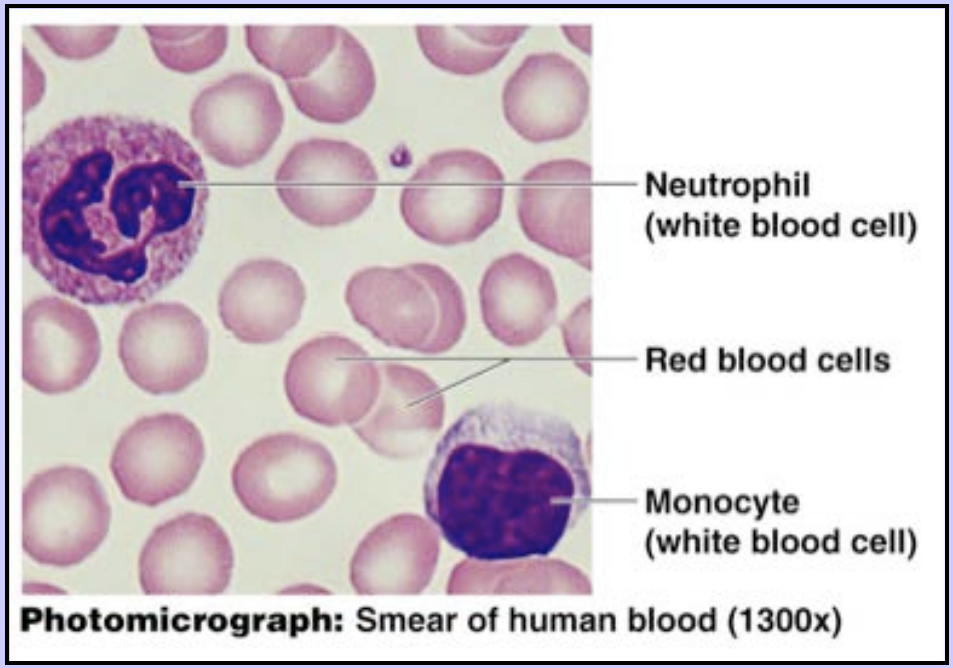
Adipose Tissue

- Adipose cells are bundled together by connective tissue.
- Each cell appears as a clear space, representing the site of the large drop of lipid (fat) before it dissolved during preparation of the microscope slide.
- The nuclei appear as small disks on the periphery of cells.
- Functions to insulate the body, protect organs, and fuel storage



B. Blood (Vascular Tissue)

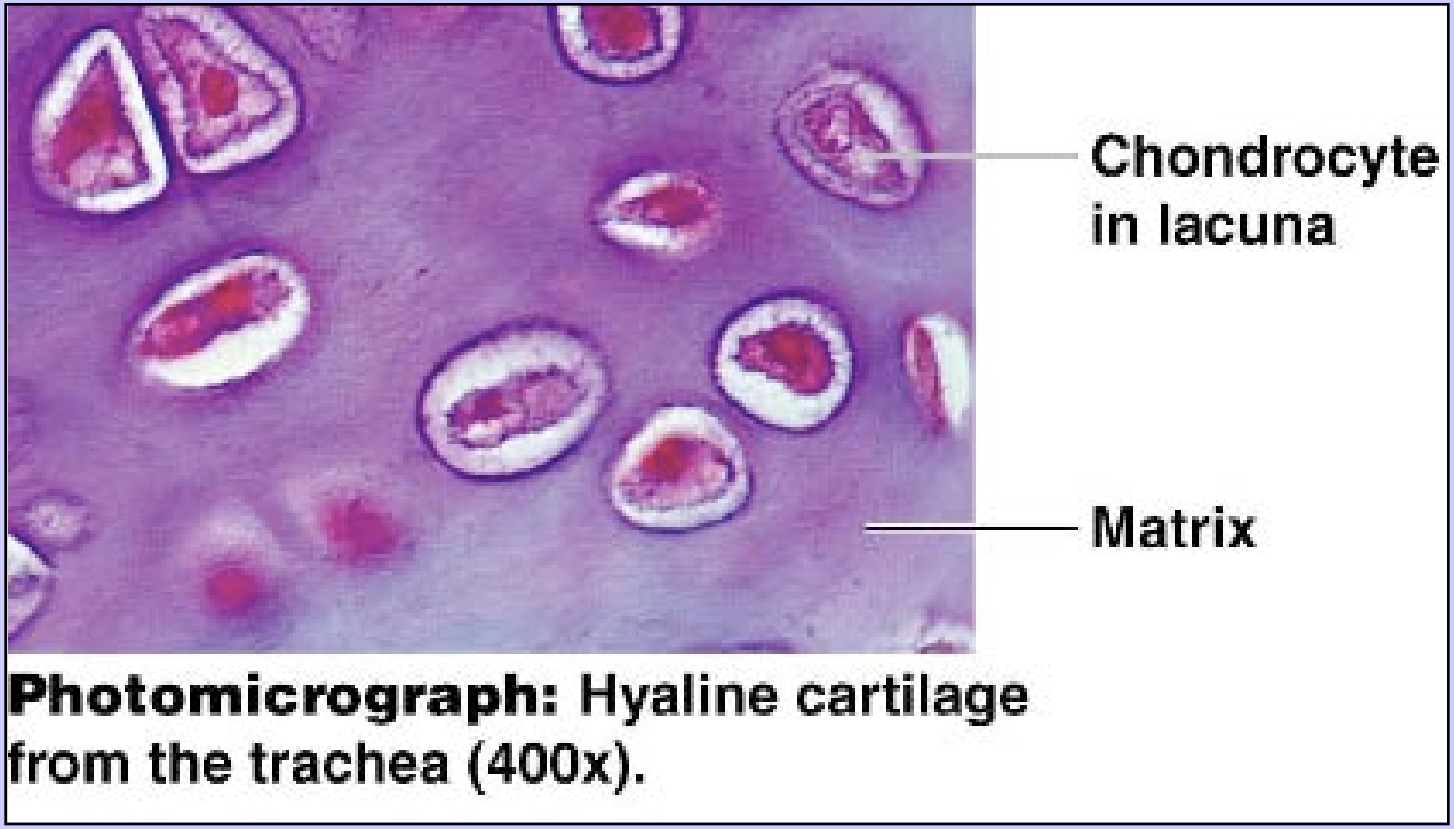
- Consists of blood cells surrounded by nonliving, fluid matrix called **blood plasma**
- 'Fibers' only visible during blood clotting
- Functions as a transport medium for materials



Photomicrograph: Smear of human blood (1300x)

C. Cartilage

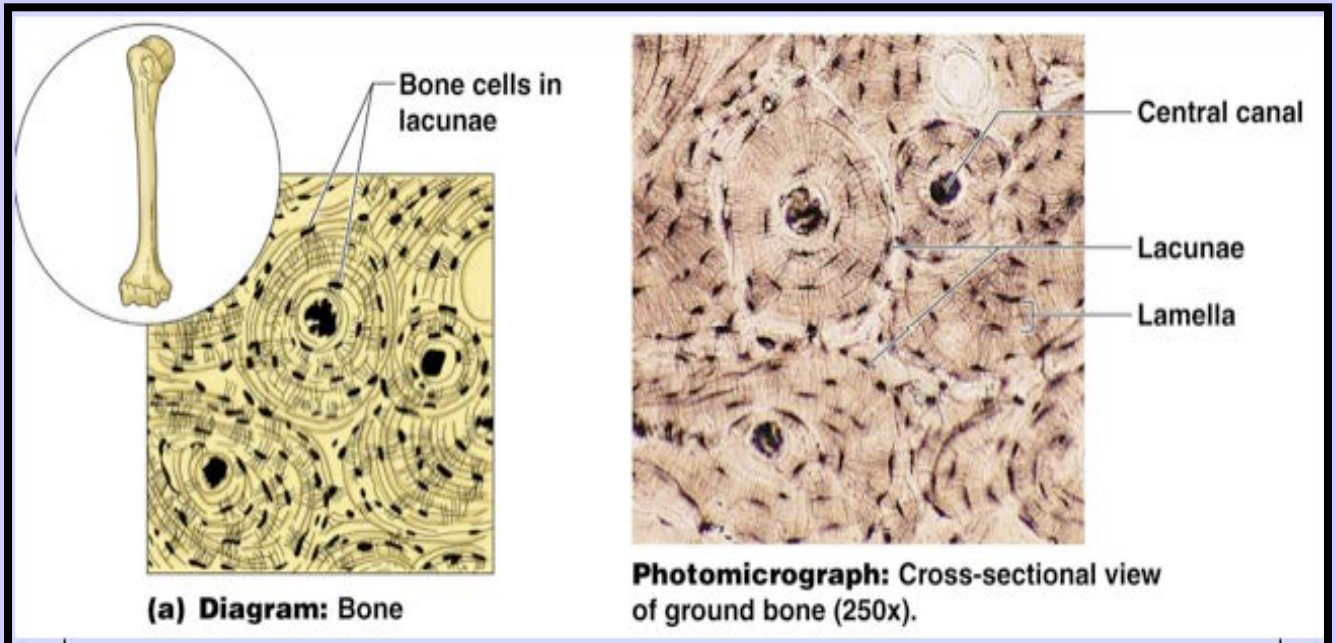
- Group of cells in a mass of intercellular substance (Matrix)
- External ears, nose, larynx, trachea, bronchi.



Photomicrograph: Hyaline cartilage from the trachea (400x).

D. Bone

- Composed of
  - Hard matrix of calcium salts
  - Large numbers of collagen fibers
- Used to protect and support the body
- Sponge or dense/ compact
- **(Haversian (central) canal – Haversian system)**

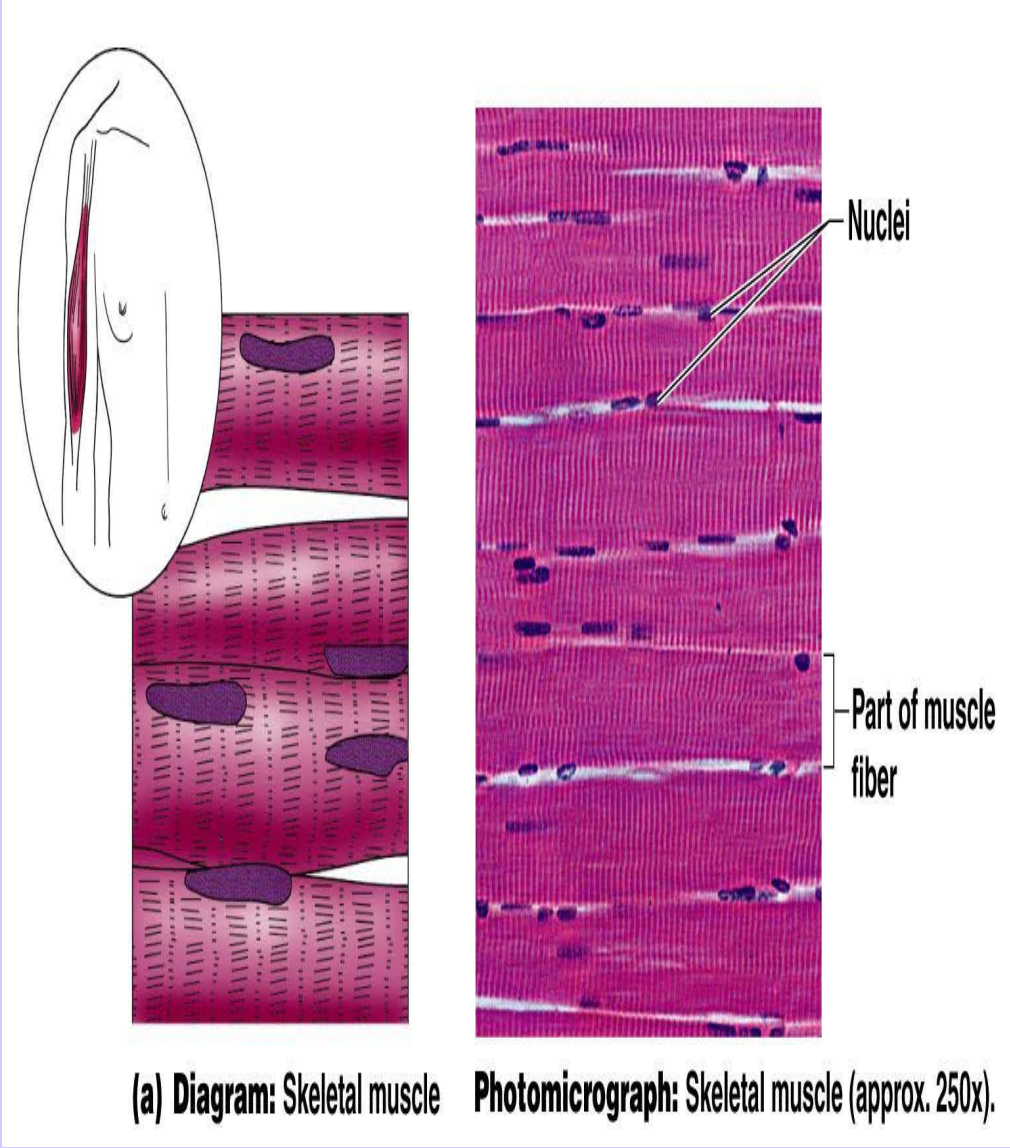


3. Muscle Tissue

- Muscle is a contractile tissue.
- There are three types of muscle:
  - Skeletal/ striated
  - Cardiac
  - Smooth / nonstriated
- Main function is to produce movement/ locomotion

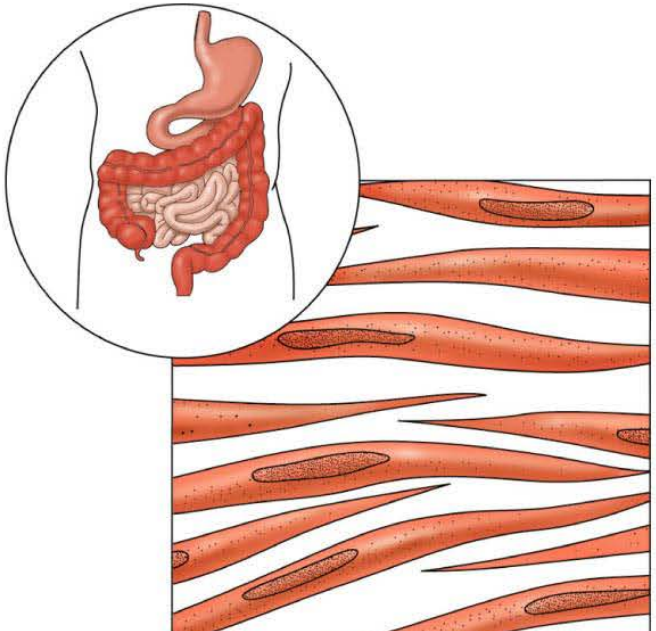
Skeletal Muscle

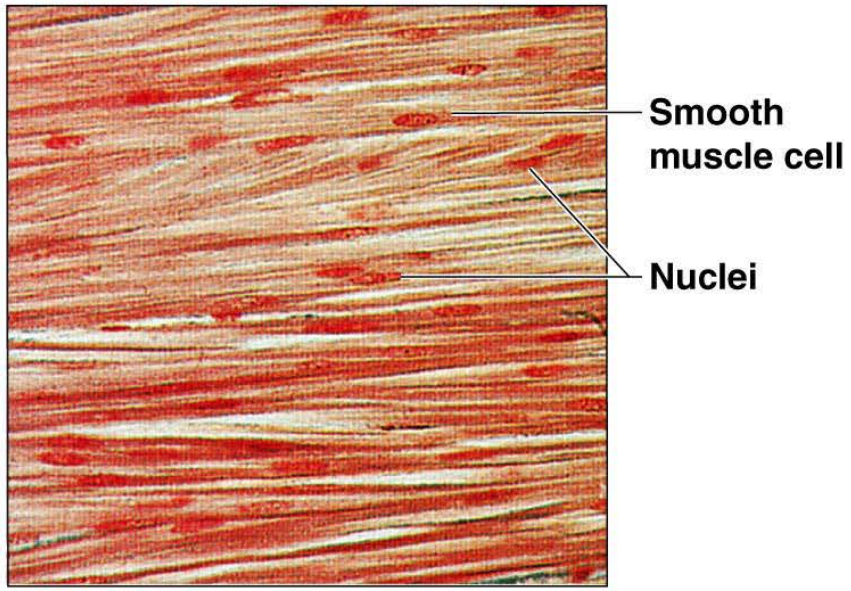
- Under **voluntary** control
- Characteristics of skeletal muscle cells
  - Striated (stripe-like pattern)
  - Multinucleate (more than one nucleus)
  - Long, cylindrical



Smooth Muscle

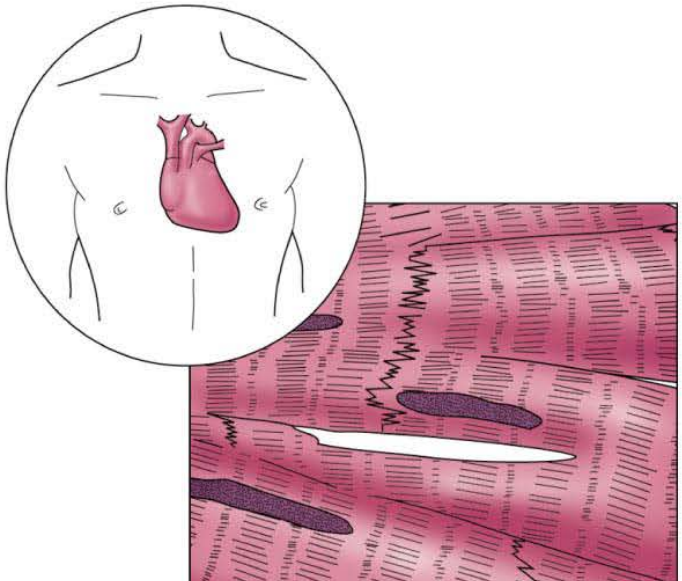
- Under **involuntary** muscle
- Found in walls of hollow organs such as stomach, uterus, and blood vessels
- Characteristics of smooth muscle cells
  - No visible striations - One nucleus/cell - Spindle-shaped cells

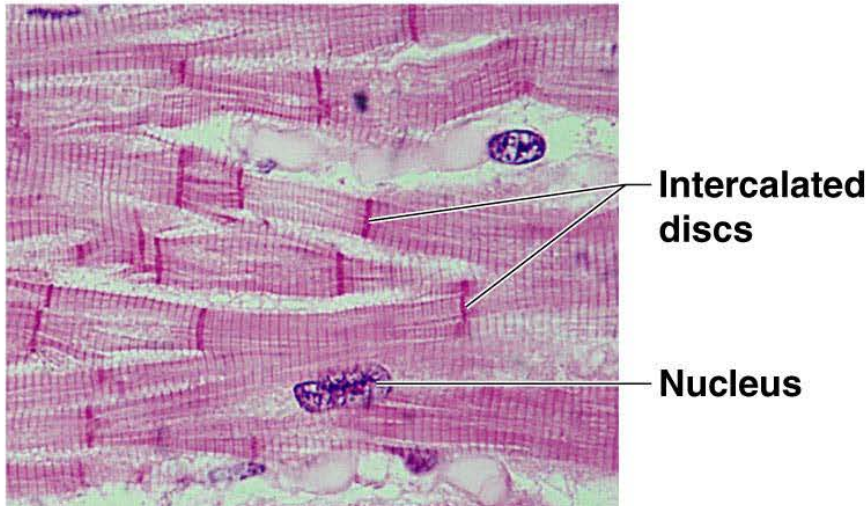




Cardiac Muscle

- Under **involuntary** control
- Found only in the heart
- Characteristics of cardiac muscle cells
  - Cells are attached to other cardiac muscle cells at **intercalated disks**
  - Striated -One nucleus/cell





4.Nervous Tissue

- Structural units are **neurons**.
- Nervous tissue also consists of **glia**, which are the various types of supporting cells in the nervous system.