BODY TISSUES

REVIEW FOR ANATOMY I
Body Tissues

1. Epithelial Tissue
2. Connective Tissue
3. Muscle Tissue
4. Nervous Tissue
When looking at a tissue slide you should go through a list of questions to find out what type of tissue you are looking at.

1: Does it line an open space??
   If yes, then automatically you know its an epithelial cell.

2: What is the distance between each cell?
   Are they stuck together → Epithelial, muscle
   Are they widely spaced apart → Bone, cartilage,
   Are they close together → Red blood cells

3: What is the cell Shape paired with the cell spacing?
   flat and stuck together → Squamous Epithelial
   round and close together → Adipose tissue
   lots of fibers in between the cells → Areolar tissue
Epithelial Tissue

Simple
1. Simple Squamous Epithelium
2. Simple Cuboidal Epithelium
3. Simple Columnar Epithelium

Stratified
1. Stratified Non-keratinized Squamous Epithelium
A. Simple squamous epithelium

**Description:** Single layer of flat cells; centrally located nucleus.

**Location:** Lines heart, blood vessels, lymphatic vessels, air sacs of lungs, glomerular (Bowman’s) capsule of kidneys, and inner surface of the tympanic membrane (eardrum); forms epithelial layer of serous membranes, such as the peritoneum, pericardium, and pleura.

**Function:** Filtration, diffusion, osmosis, and secretion in serous membranes.

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**Example 1**

- **Peritoneum**
- **Nucleus of simple squamous cell**
- **Cytoplasm**
- **Plasma membrane**
- **Surface view of simple squamous epithelium of mesothelial lining of peritoneum**
- **Flat nucleus of simple squamous cell**
- **Connective tissue**
- **Muscular tissue**

**Example 2**
**B. Simple cuboidal epithelium**

**Description:** Single layer of cube-shaped cells; centrally located nucleus.

**Location:** Covers surface of ovary, lines anterior surface of capsule of the lens of the eye, forms the pigmented epithelium at the posterior surface of the eye, lines kidney tubules and smaller ducts of many glands, and makes up the secreting portion of some glands such as the thyroid gland and the ducts of some glands such as the pancreas.

**Function:** Secretion and absorption.

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![Microscopic image of simple cuboidal epithelium](image)

*Simple cuboidal epithelium*

*Connective tissue*

*Nucleus of simple cuboidal cell*

*Lumen of duct*

*Simple cuboidal cell*

*Basement membrane*

*Connective tissue*
C. Nonciliated simple columnar epithelium

**Description:** Single layer of nonciliated column-like cells with nuclei near base of cells; contains goblet cells and cells with microvilli in some locations.

**Location:** Lines the gastrointestinal tract (from the stomach to the anus), ducts of many glands, and gallbladder.

**Function:** Secretion and absorption.

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**Microscope Example**

**Example 1**

**Example 2**
Stratified Non-keratinized Squamous Epithelium

Description: Several layers of cells; cuboidal to columnar shape in deep layers; squamous cells form the apical layer and several layers deep to it; cells from the basal layer replace surface cells as they are lost.

Location: Keratinized variety forms superficial layer of skin; nonkeratinized variety lines wet surfaces, such as lining of the mouth, esophagus, part of larynx, part of pharynx, and vagina, and covers the tongue.

Function: Protection.

Keratinized Example
Microscope Example
Other Example

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Keratinized vs. nonkeratinized stratified squamous epithelium
Simple Squamous Epithelium
Simple Squamous Epithelium
Simple Columnar Epithelium
Simple Columnar Epithelium
Simple Cuboidal Epithelium
Simple Cuboidal Epithelium
Simple Cuboidal Epithelium
Stratified Non-keratinized Squamous Epithelium
Stratified Non-keratinized Squamous Epithelium
Connective Tissue

“It’s all about the extracellular matrix!”
Mature connective tissue

A. Loose connective tissue
   1. Areolar Connective Tissue
   2. Adipose Tissue

B. Dense Connective Tissue
   3. Dense Regular Connective Tissue

C. Cartilage
   4. Hyaline cartilage

D. Bone tissue
   5. Osseous Tissue

E. Liquid connective tissue
   6. Blood tissue
A. Areolar connective tissue

**Description:** Consists of fibers (collagen, elastic, and reticular) and several kinds of cells (fibroblasts, macrophages, plasma cells, adipocytes, and mast cells) embedded in a semifluid ground substance.

**Location:** Subcutaneous layer deep to skin; papillary (superficial) region of dermis of skin; lamina propria of mucous membranes; and around blood vessels, nerves, and body organs.

**Function:** Strength, elasticity, and support.

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**Loose Connective Tissue**

**Areolar Tissue**

Microscope Example

Back

Other Example

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B. Adipose tissue

**Description:** Consists of adipocytes, cells specialized to store triglycerides (fats) as a large centrally located droplet; nucleus and cytoplasm are peripherally located.

**Location:** Subcutaneous layer deep to skin, around heart and kidneys, yellow bone marrow, and padding around joints and behind eyeball in eye socket.

**Function:** Reduces heat loss through skin, serves as an energy reserve, supports, and protects. In newborns, brown adipose tissue generates considerable heat that helps maintain proper body temperature.

**Microscope Example:**

![Microscope Image of Adipose Tissue](image_url)
Dense or Fibrous Connective Tissue

**D. Dense regular connective tissue**

*Description:* Extracellular matrix looks shiny white; consists mainly of collagen fibers regularly arranged in bundles; fibroblasts present in rows between bundles.

*Location:* Forms tendons (attach muscle to bone), most ligaments (attach bone to bone), and aponeuroses (sheetlike tendons that attach muscle to muscle or muscle to bone).

*Function:* Provides strong attachment between various structures.

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**Microscope Example**

- **Tendon**
- **Skeletal muscle**
- **Nucleus of fibroblast**
- **Collagen fiber**

*Sectional view of dense regular connective tissue of a tendon*

*Dense regular connective tissue*
**Hyaline cartilage**

*Description:* Consists of a bluish-white, shiny ground substance with thin, fine collagen fibers and many chondrocytes; most abundant type of cartilage.

*Location:* Ends of long bones, anterior ends of ribs, nose, parts of larynx, trachea, bronchi, bronchial tubes, and embryonic and fetal skeleton.

*Function:* Provides smooth surfaces for movement at joints, as well as flexibility and support.
**Bones**

**Compact Bone**

*Description:* Compact bone tissue consists of osteons (haversian systems) that contain lamellae, lacunae, osteocytes, canaliculi, and central (haversian) canals. By contrast, spongy bone tissue (see Figure 6.3 on page 180) consists of thin columns called trabeculae; spaces between trabeculae are filled with red bone marrow.

*Location:* Both compact and spongy bone tissue make up the various parts of bones of the body.

*Function:* Support, protection, storage; houses blood-forming tissue; serves as levers that act with muscle tissue to enable movement.

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**Microscope Example**

*Details of an osteocyte*

*Sectional view of several osteons (haversian systems) of femur (thigh bone) and details of one osteon*
Liquid Connective Tissue

Blood

**K. Blood**

**Description:** Consists of blood plasma and formed elements: red blood cells (erythrocytes), white blood cells (leukocytes), and platelets (thrombocytes).

**Location:** Within blood vessels (arteries, arterioles, capillaries, venules, and veins) and within the chambers of the heart.

**Function:** Red blood cells transport oxygen and some carbon dioxide; white blood cells carry on phagocytosis and are involved in allergic reactions and immune system responses; platelets are essential for the clotting of blood.
Loose Connective Tissue - Areolar
Loose Connective Tissue - Areolar
Loose Connective Tissue - Adipose
Loose Connective Tissue - Adipose
Dense or Fibrous Connective Tissue - Tendon
Cartilage - Hyaline
Cartilage - Hyline
Compact Bone
Blood
Blood
Muscular Tissue

1. Skeletal
2. Cardiac
3. Smooth
How to Indentify...

- Look for striations (indicates skeletal or cardiac)
- Look in intercalated disks (indicating cardiac)
**Muscular Tissues**

A. **Skeletal muscle tissue**

**Description:** Long, cylindrical, striated fibers with many peripherally located nuclei; voluntary control.

**Location:** Usually attached to bones by tendons.

**Function:** Motion, posture, heat production, and protection.

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**Skeletal Muscle**

**Microscope Example**

**Other Example**

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Cardiac Muscle

B. Cardiac muscle tissue

**Description:** Branched striated fibers with one or two centrally located nuclei; contains intercalated discs; involuntary control.

**Location:** Heart wall.

**Function:** Pumps blood to all parts of the body.

- **Nucleus**
- **Cardiac muscle fiber (cell)**
- **Intercalated disc**
- **Striations**

![Cardiac muscle fibers](image)

Longitudinal section of cardiac muscle tissue
Smooth Muscle

**C. Smooth muscle tissue**

**Description:** Spindle-shaped (thickest in middle and tapering at both ends), nonstriated fibers with one centrally located nucleus; involuntary control.

**Location:** Iris of the eyes, walls of hollow internal structures such as blood vessels, airways to the lungs, stomach, intestines, gallbladder, urinary bladder, and uterus.

**Function:** Motion (constriction of blood vessels and airways, propulsion of foods through gastrointestinal tract, contraction of urinary bladder and gallbladder).

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**Longitudinal section of smooth muscle tissue**

- Smooth muscle fiber (cell)
- Nucleus of smooth muscle fiber
Skeletal Muscle
Skeletal Muscle
Smooth Muscle
Smooth Muscle
Nervous Tissue
**Nervous Tissue**

**Description:** Consists of neurons (nerve cells) and neuroglia. Neurons consist of a cell body and processes extending from the cell body (multiple dendrites and a single axon). Neuroglia do not generate or conduct nerve impulses but have other important supporting functions.

**Location:** Nervous system.

**Function:** Exhibits sensitivity to various types of stimuli, converts stimuli into nerve impulses (action potentials), and conducts nerve impulses to other neurons, muscle fibers, or glands.

![Diagram of Nervous Tissue]

**Neuron of spinal cord**

400x

- Dendrite
- Nucleus of neuroglial cell
- Nucleus in cell body
- Axon

*Microscope Example*
Nervous Tissue
Nervous Tissue
Questions

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