

Chapter 5 Tissues & Systems

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Introduction

- **Cells:** the basic building blocks of our bodies
- **Tissues:** collections of cells united to perform a function
- **Organs:** collections of tissues designed to perform particular functions
- **Systems:** Organs that work together to perform major specific activities, often with the help of accessory structures



Muscle cell



Muscle tissue



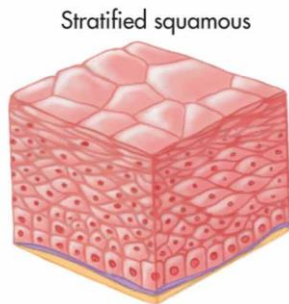
Organ (bladder)



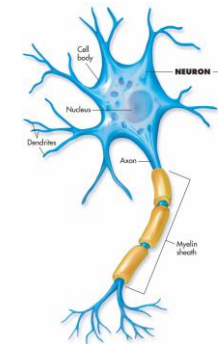
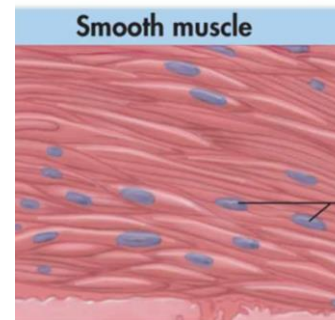
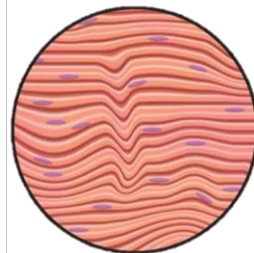
Organ system

Tissues

- Imagine the cells as bricks, placed in a specific pattern to create functional walls of a building.
- The four main types of tissues are:
 - A. Epithelial
 - B. Connective
 - C. Muscle
 - D. Nervous

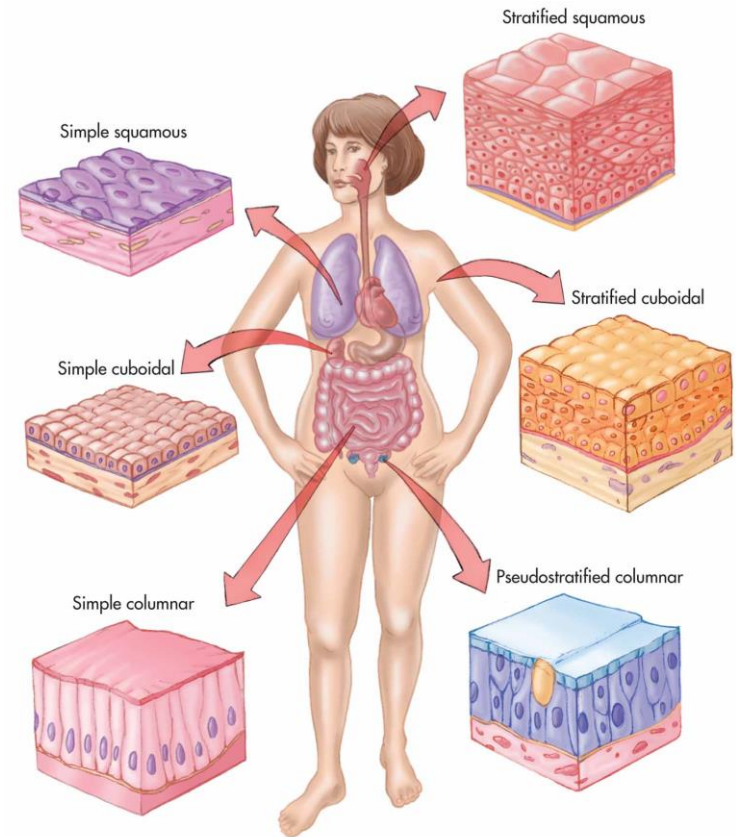


Dense Connective Tissue



Tissues: Epithelial Tissue

- **Epithelial Tissue:** Covers and lines the body (skin and linings of your hollow organs).
- **Characteristics:**
 1. Covering & lining
 2. Tightly packed cells forming a sheet
 3. No blood vessels
 4. Well innervated
 5. Has obvious top and bottom

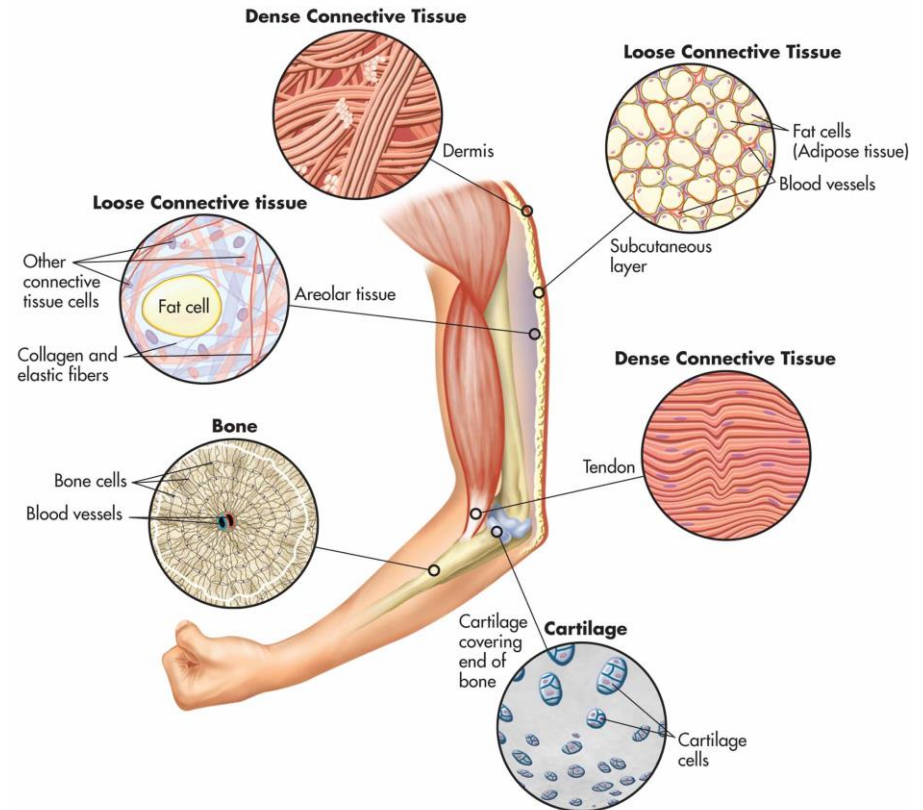


Tissues: Connective Tissue

- **Connective Tissue:** the most common of the tissues and is found throughout the body in organs, bones, muscles, membranes, and skin.

- **Functions** include:

1. Mechanical Support
2. Nutrient storage
3. Fluid storage
4. Defense



Tissues: Connective Tissue

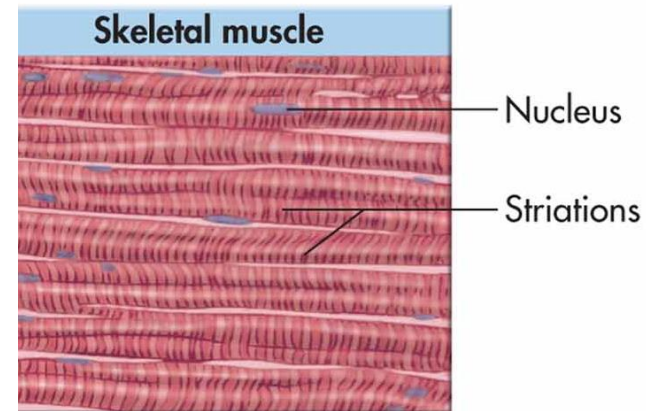
- Connective Tissue can be divided into four subcategories:
 1. **Connective Tissue Proper**
 - Loose – soft, web-like – holds tissues and organs together
 - Dense – tightly packed fibers – form strong cordlike structures for tendons and ligaments
 2. **Cartilage** – cells in holes in a gel-like matrix
 3. **Blood** – cells in a liquid matrix
 4. **Bone** – cells in a calcium matrix – very hard to support your body and store nutrients/minerals

Tissues: Muscle

- Muscle tissue provides the means for movement, by and in our bodies.
- This form of tissue has the ability to shorten itself (contractility).
- There are three types of muscle tissue:
 1. Skeletal
 2. Cardiac
 3. Smooth

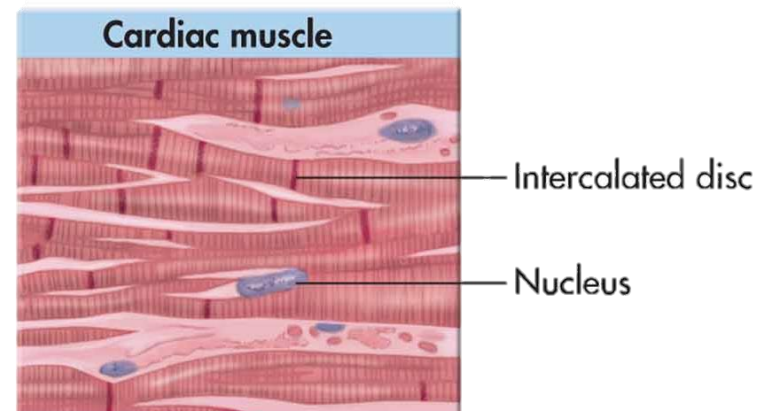
Skeletal Muscle

- **Skeletal Muscle** is attached to bones and causes movement by contracting and relaxing.
 - **Striated** – has striped appearance
- The cells that make up skeletal muscle are long, cylindrical, and fiber-like with many nuclei in each cell.
- The brain controls muscle - because we consciously control these muscles, they are also called **voluntary** muscles.



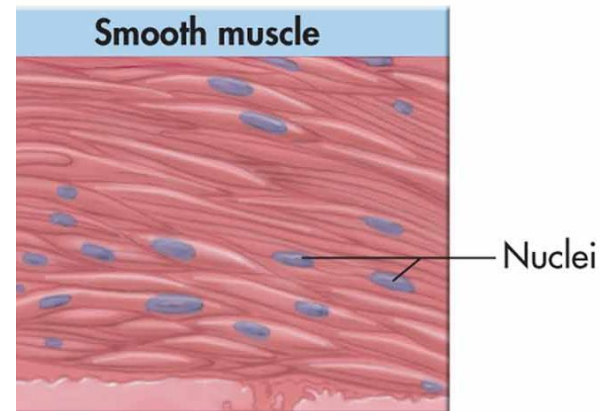
Cardiac Muscle

- **Cardiac Muscle** is found in the walls of the heart.
 - **Striated** – has striped appearance
- The cells in this type of tissue interlock with each other. This makes for a more efficient contraction.
- Our hearts beat without conscious control so this muscle type is considered an **involuntary** muscle tissue.

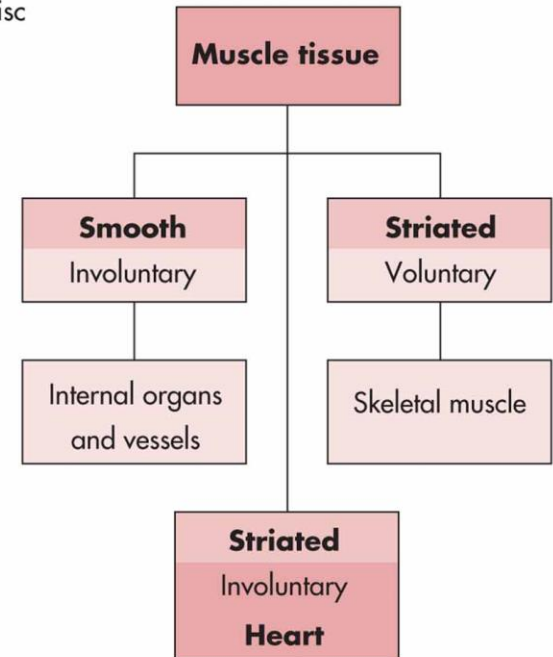
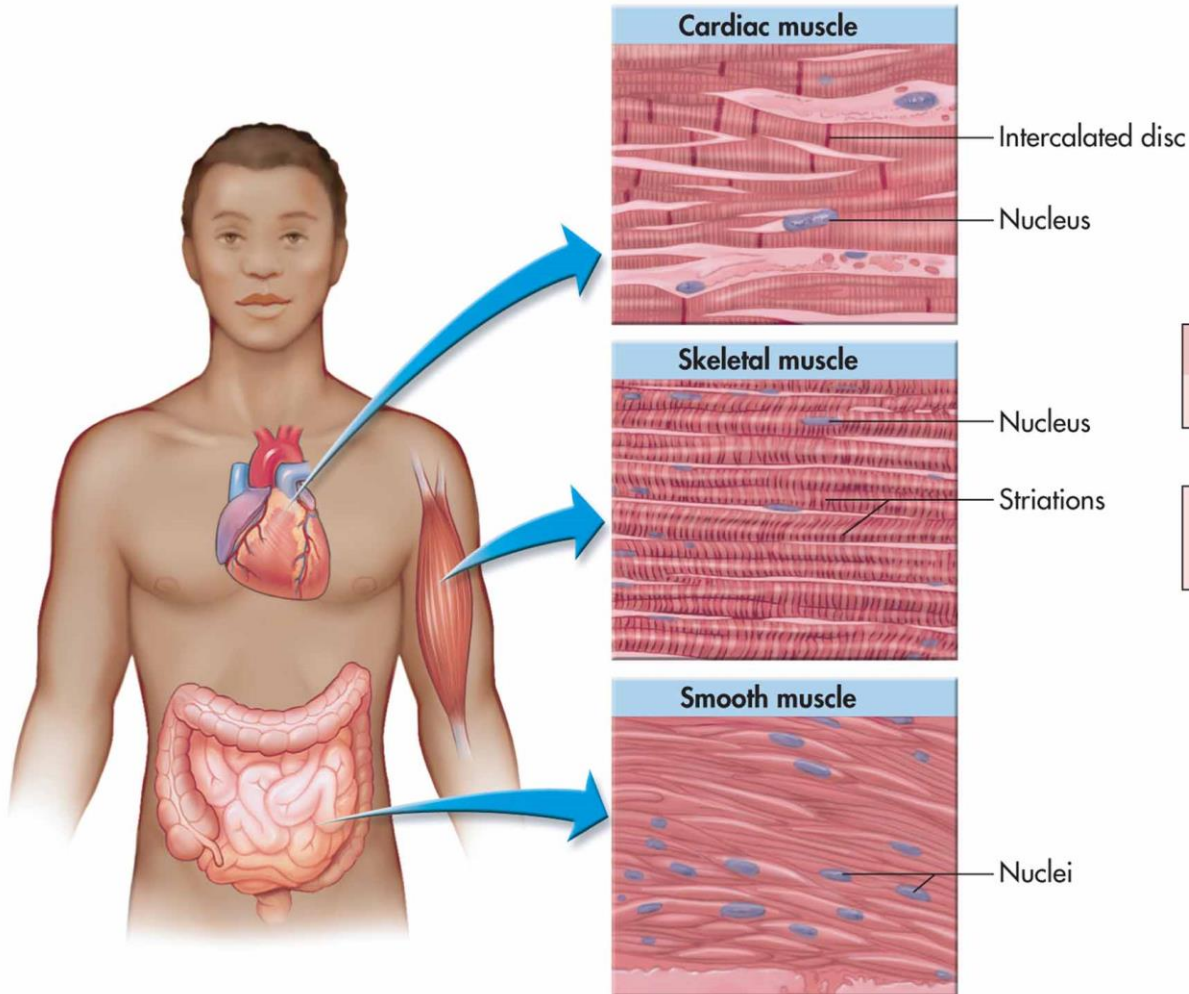


Smooth Muscle

- **Smooth Muscle** tissue forms the walls of hollow organs such as in our digestive system and blood vessels.
 - **No striations**
- Cells forming this tissue are not as long and fibrous as skeletal muscles and each cell has only one nucleus (uninucleate).
- We don't control these muscles with our thoughts, so they are also called **involuntary** muscles.

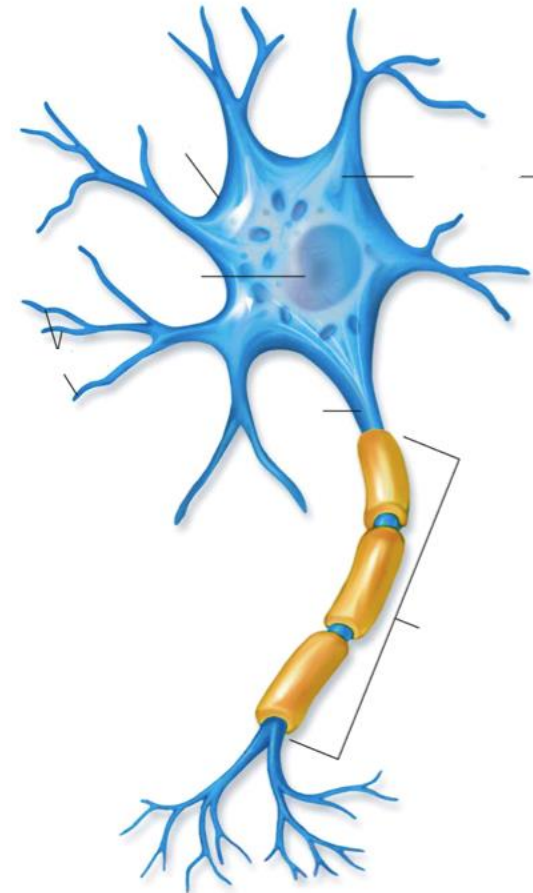


Tissues: Muscle



Tissues: Nervous

- **Nervous Tissue** acts as a rapid messenger service for the body and its messages can cause actions to occur. It is a control system.
- There are two types of nerve cells:
 - **Neurons** – Conductors of information
 - **Glia (or neuroglia)** – Support and connection cells
- The membranes that cover the brain and spinal cord are called **meninges**.
- Many nerves have an insulating layer called the **myelin sheath**.

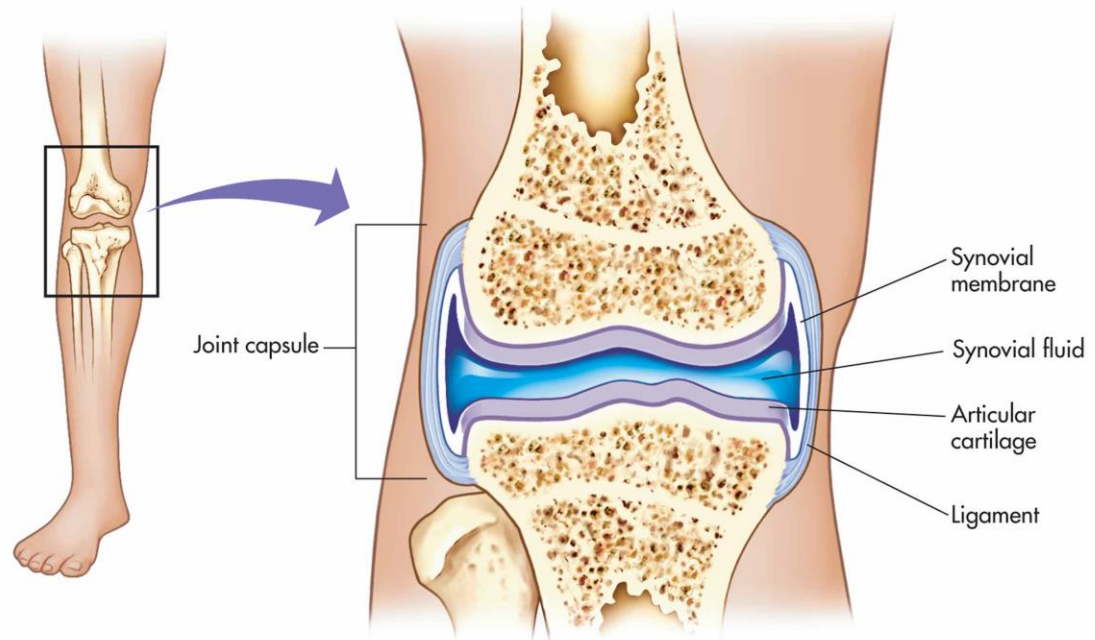


Side Note: Membranes

- Membranes are sheet-like structures found throughout the body that perform special functions.
- Membranes classified as epithelial membranes possess a layer of epithelial tissue and a bottom layer of a specialized connective tissue.

- **Synovial membrane**

- Found in joints
- Secretes lubrication fluid



Tissue Repair

A. Tissue Repair is a **multistep process**

1. Inflammation – redness, heat, swelling, pain
2. Clotting and scab formation
3. Results:
 - Regeneration – replacement with original tissue
 - Scarring – replacement with scar tissue

B. Tissue Regeneration ability depends on the **tissue type**

1. Excellent – bone, blood, and epithelium
2. Fair – Cartilage, skeletal muscle, dense connective tissue
3. Terrible – nervous tissue and cardiac muscle

Organs

- **An Organ** is the result of two or more types of tissues organized in such a way as to accomplish something that the tissues cannot do on their own.
- The body cannot survive without organs known as vital organs.
 - **Vital organs**: Heart, brain, kidneys, liver, and lungs
 - **Non-vital organs**: Everything else (appendix, spleen, gallbladder, etc.)
- Organs work as part of a system.

Systems

- **A System** is formed by organs that work together to accomplish something more complex than what a single organ can do on its own.
- Each system is connected, often **depending on other systems** for the proper functioning of your body.
 - The heart, for example – can function perfectly, but would still die without all the other parts that make up the cardiovascular system.

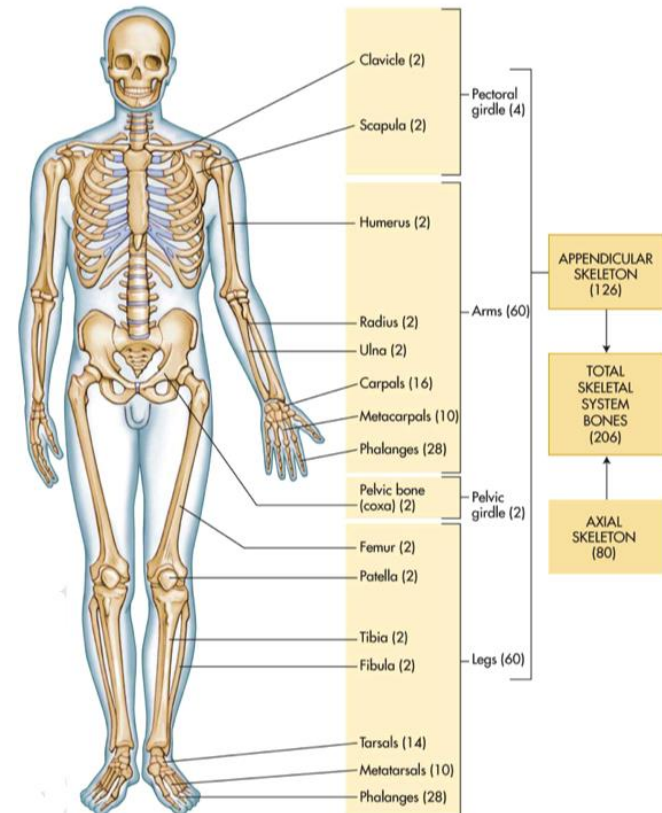
Systems: The Skeletal System

- **The Skeletal System** is mainly composed of bones, joints, ligaments, and cartilage.

- **Functions:**

- Provides **support** and **structure** for the body
- **Protects organs**
- Provides movement
- **Stores a variety of minerals**
- Produces blood cells

- There are 206 bones in the body



Systems: The Muscular System

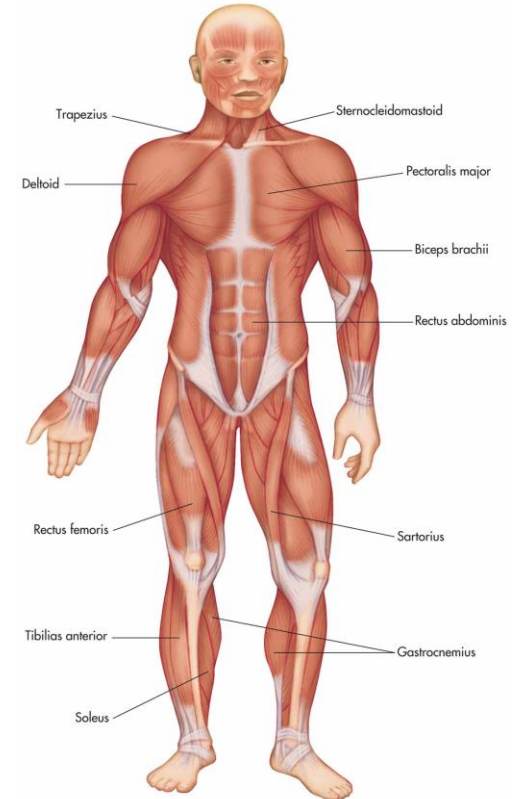
- **The Muscular System** is responsible for voluntary and involuntary movements.

- **Voluntary muscles**

- Movement created by conscious thought, like scratching your nose
- Skeletal muscles attached to your bones

- **Involuntary muscles**

- Perform without conscious thought
- Classified as smooth muscle or cardiac muscle
- Found in blood vessels, airways, and organs

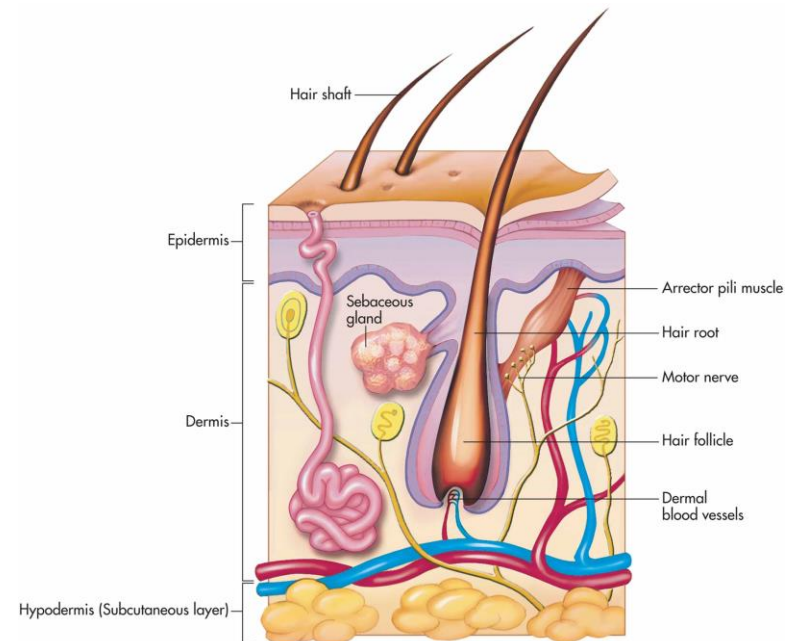


Systems: The Integumentary System

- **The Integumentary System** is composed of the skin, hair, sweat glands, sebaceous glands, and nails.
- Skin is the body's first line of protection.

- **Functions:**

- **Temperature regulation**
- Sense of touch
- Glands in the skin help to lubricate and waterproof the skin and inhibit the growth of unwanted bacteria
- Production of vitamin D when exposed to sunlight

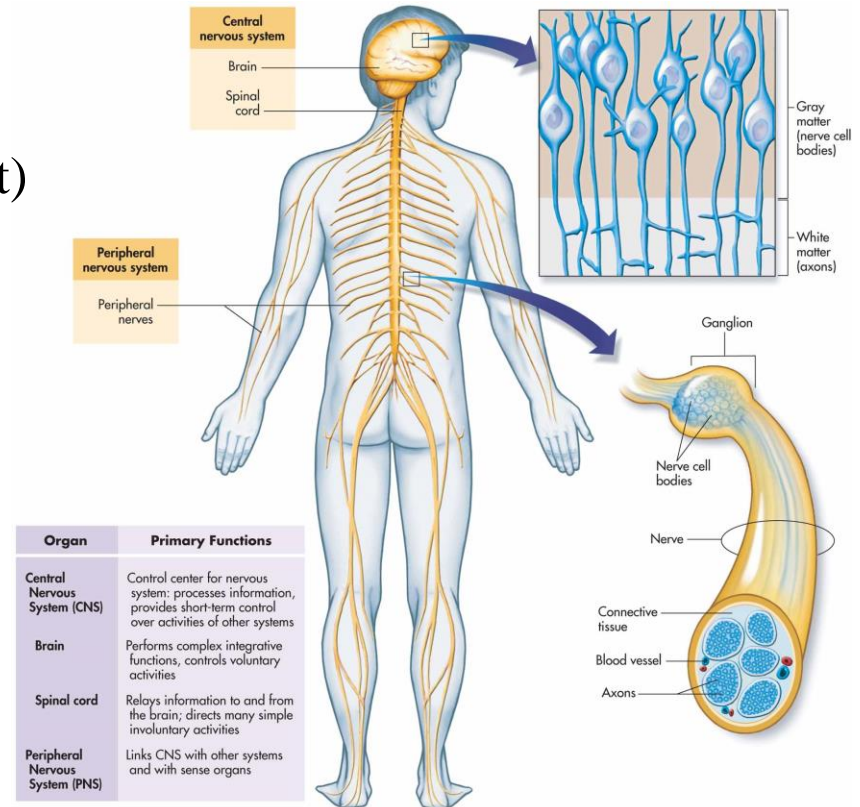


Systems: The Nervous System

- **The Nervous System** includes the spinal cord, brain, peripheral nerves, and nerve cells.

- **Functions:**

- Receiving **messages** (sensory input)
- Processing and interpreting **messages**
- Acting on **message** (motor output)

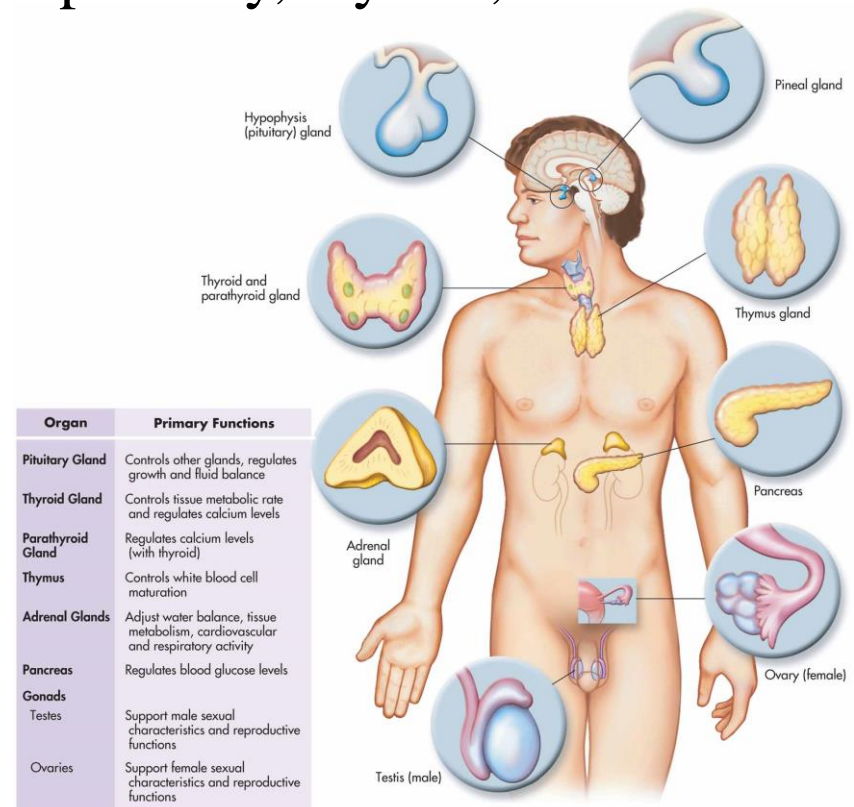


Systems: The Endocrine System

- **The Endocrine System** acts as a control center for virtually all of the body's organs. It is composed of many parts including the hypothalamus, the pituitary, thyroid, the adrenal glands, and the gonads.

- **Functions:**

- Releases **hormones**
- Regulates metabolic processes
- Uses metabolites for **growth & reproduction**
- Regulates fluids & electrolytes

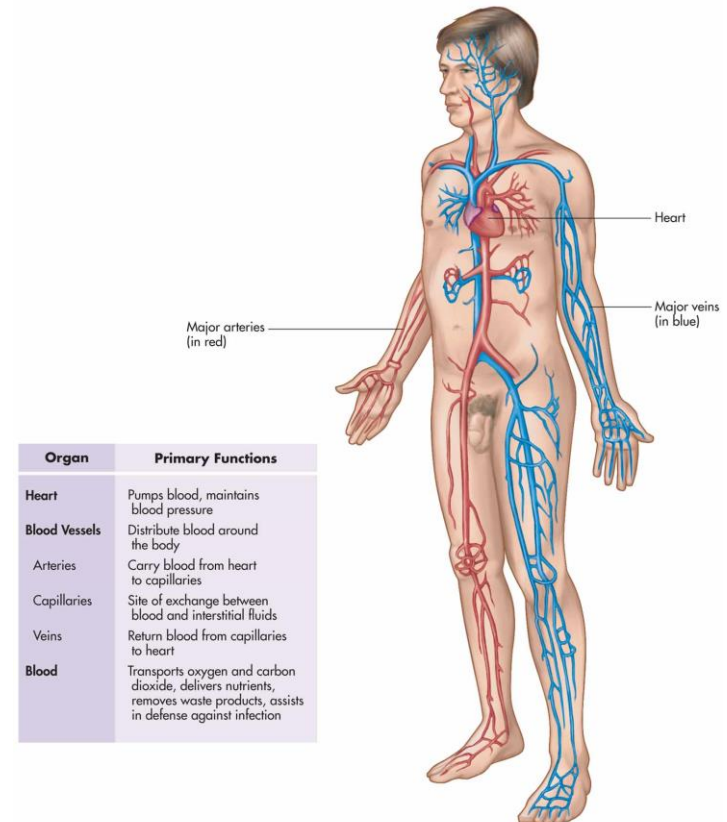


Systems: The Cardiovascular System

- **The Circulatory System** is the main transportation system to each cell of our body. It is mainly composed of the heart, arteries, veins, capillaries, and blood.

- **Functions:**

- **Transports water, oxygen, & nutrients to cells**
- **Transports waste products away from the cells**

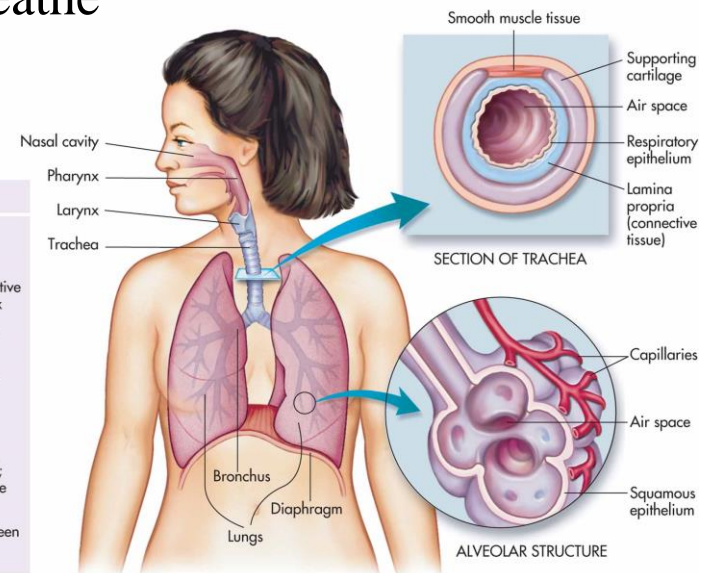


Organ	Primary Functions
Heart	Pumps blood, maintains blood pressure
Blood Vessels	Distribute blood around the body
Arteries	Carry blood from heart to capillaries
Capillaries	Site of exchange between blood and interstitial fluids
Veins	Return blood from capillaries to heart
Blood	Transports oxygen and carbon dioxide, delivers nutrients, removes waste products, assists in defense against infection

Systems: The Respiratory System

- **The Respiratory System** is mainly composed of the pharynx, larynx, trachea, bronchial tubes and the lungs.
- **Functions:**
 - Supplies the cells with **oxygen** and removes **carbon dioxide**
 - Filters, warms, and moistens the air we breathe
 - The mucous lining of the airway helps trap foreign particles and germs

Organ	Primary Functions
Nasal Cavities	Filter, warm, humidify air; detect smells
Pharynx	Chamber shared with digestive tract; conducts air to larynx
Larynx	Protects opening to trachea and contains vocal cords
Trachea	Filters air, traps particles in mucus; cartilages keep airway open
Bronchi	Same as trachea
Lungs	Include airways and alveoli; volume changes responsible for air movement
Alveoli	Sites of gas exchange between air and blood

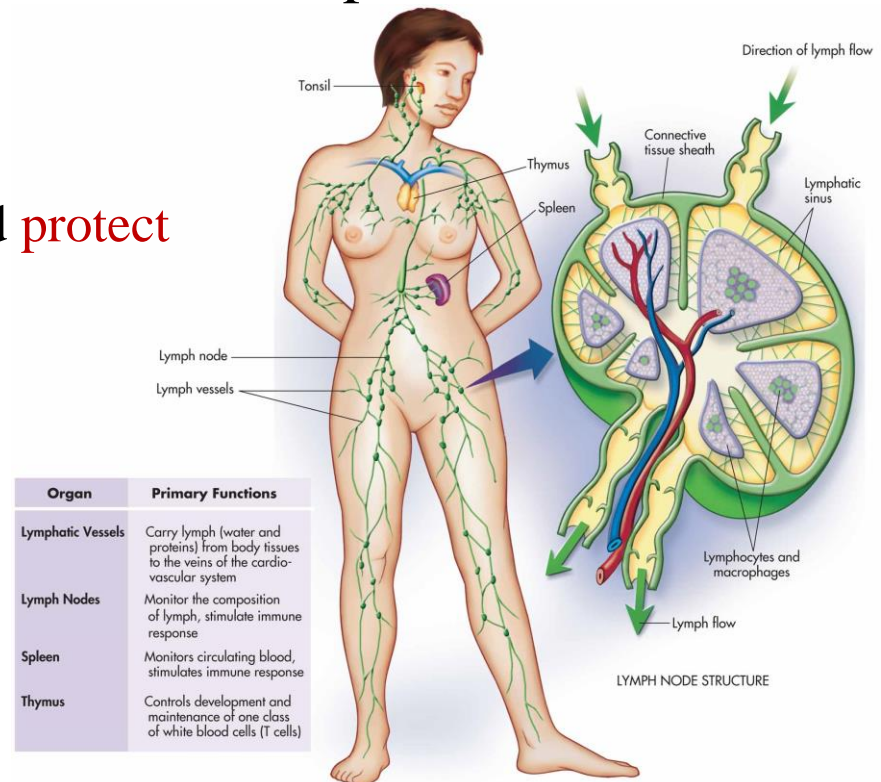


Systems: Lymphatic & Immune System

- **The Lymphatic System** is like the storm drain system in our city. **The Immune System** is made up of lymph vessels/ducts, lymph nodes, tonsils, and the spleen.

- **Functions**

- Maintains proper fluid balance and **protect us from infection**
- Lymph nodes act as filters to capture unwanted infectious agents
- Produces special white cells (lymphocytes) to fight infection.

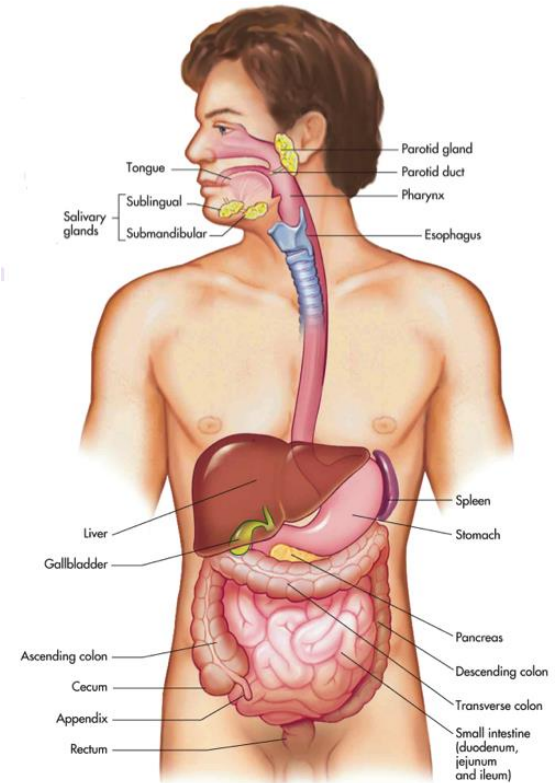


Systems: The Digestive System

- **The Gastrointestinal (GI) System** takes the raw material (food) and breaks it down both mechanically and chemically into usable substances, then absorbs these substances for transportation to the cells.

- **Functions:**

- Ingestion
- Digestion (breakdown)
- Absorption of nutrients
- Solid waste removal

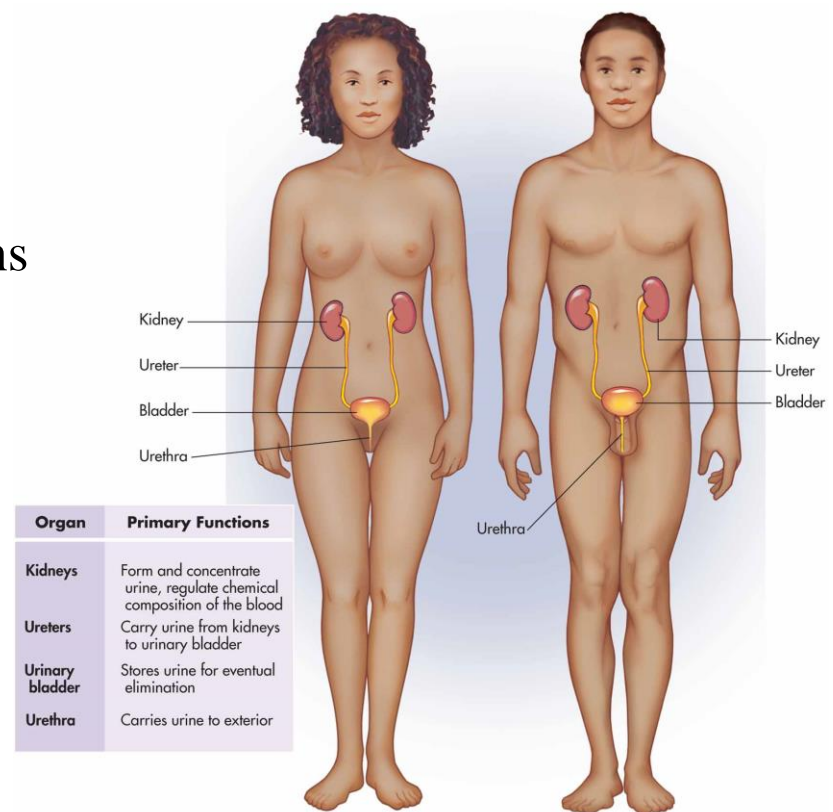


Systems: The Urinary System

- **The Urinary System** is made up of the kidneys, ureters, the urinary bladder and the urethra.

- **Functions:**

- Elimination of **waste products**, electrolytes, drugs, and other toxins
- Fluid regulation
- Blood pressure regulation
- Regulation of red blood cells
- Electrolyte balance
- pH balance



Systems: Reproductive System

- **The Reproductive System** is often combined with the urinary system to make the genitourinary system or GU system.

- **Functions:**
 - **Reproduction**

