

# Introduction to Biology

## BIO 101

### Human body

### Tissue, Organ and Glands

### Lecture 05



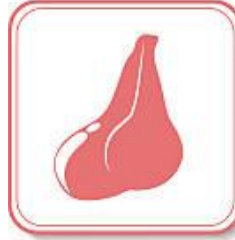
*Adrenal gland*



*Thyroid*



*Pancreas*



*Pituitary gland*



*Brain*



*Brain*



*Ovary*

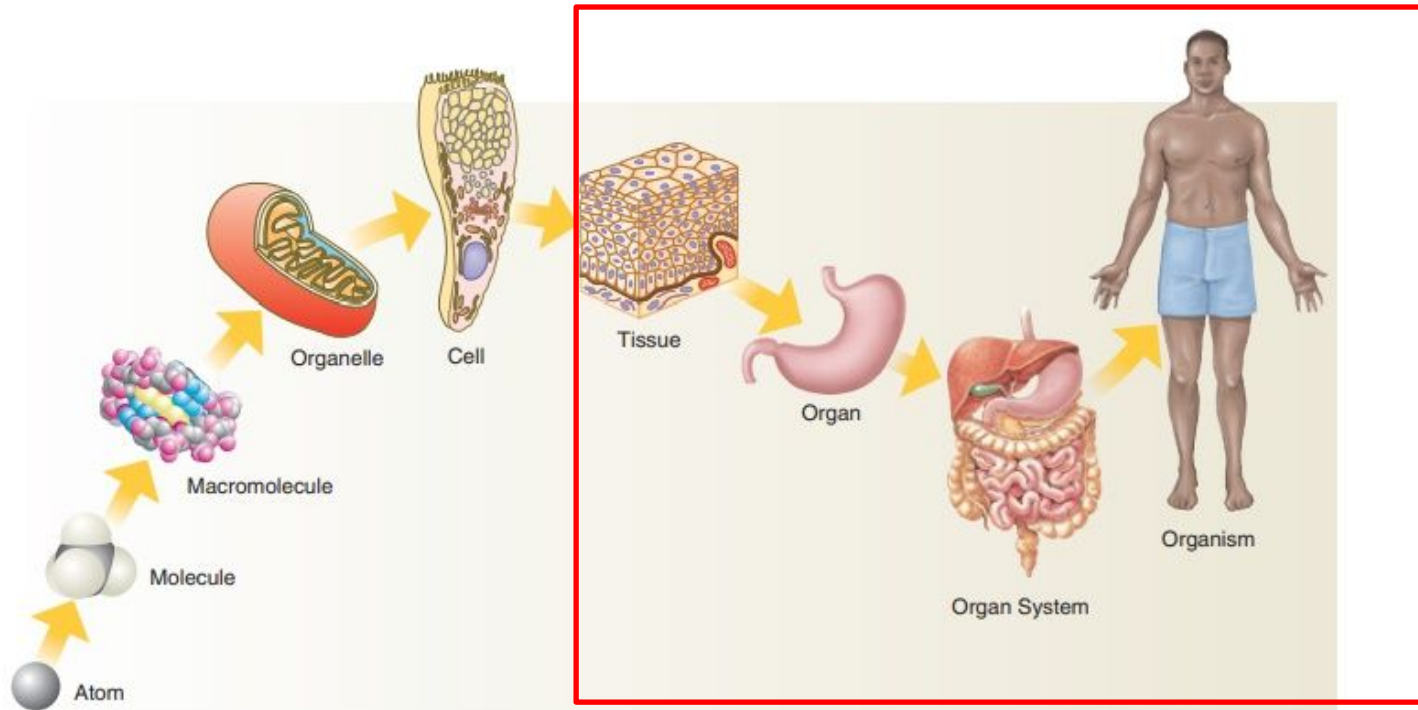


*Testicle*



*Thymus*

# Level of organization



**FIGURE 1-1** Organization levels of the body.

Adapted from Shier, D.N., Butler, J.L., and Lewis, R. *Hole's Essentials of Human Anatomy & Physiology*, Tenth edition. McGraw Hill Higher Education, 2009.

# Tissue

- Group of cells having similar structure
- Perform specialized activity
- Usually found together
- Held together by extracellular fluid and fibers

More than 200 cell types make up four major tissues of the body.

1. Epithelial tissue
2. Connective tissue
3. Muscle tissue
4. Nervous tissue

**Nervous tissue**

- Nervous tissue of the brain
- Nervous tissue of the spinal cord
- Nerves

**Epithelial tissue**

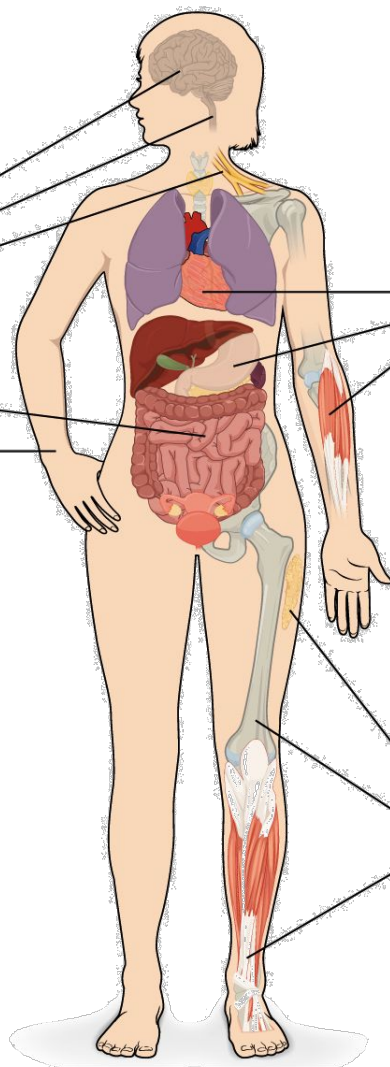
- Lining of GI tract organs and other hollow organs
- Skin surface (epidermis)

**Muscle tissue**

- Cardiac muscle
- Smooth muscle
- Skeletal muscle

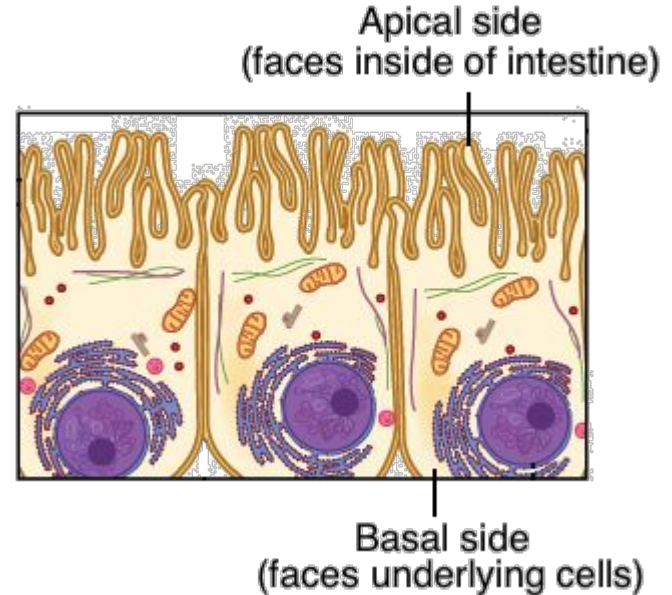
**Connective tissue**

- Fat and other soft padding tissue
- Bone
- Tendon



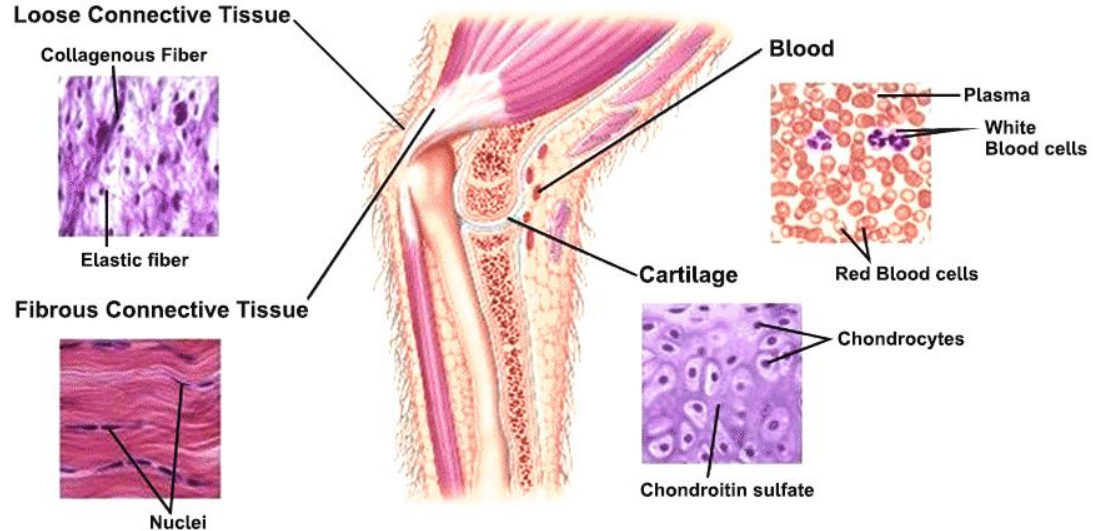
# Epithelial Tissue

- Consists of tightly packed cells arranged in a continuous sheet with one or more layers, and this lets them act as barriers to the movement of fluids and potentially harmful microbes
- Covers the surface of organs
- Lines cavities and canals
- Forms tubes and ducts
- Provides the secreting portions of glands
- Makes up the epidermis of the skin
- Epithelial cells are polarized
- e.g.
  - Skin
  - Internal covering of GIT



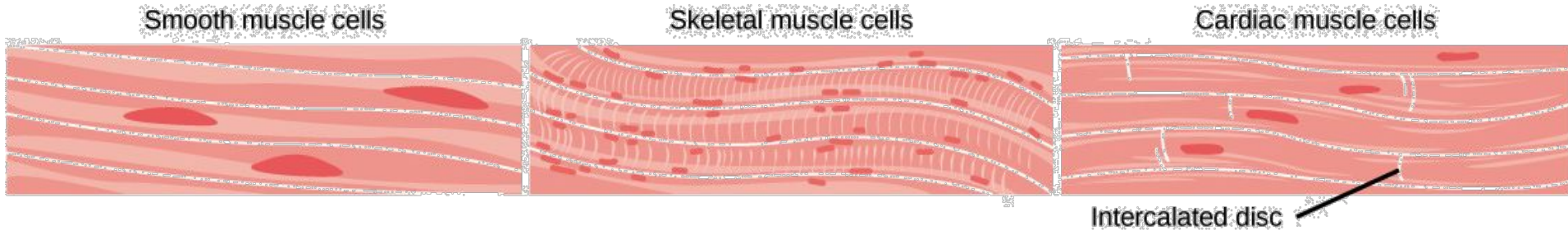
# Connective Tissue

- Made up of diverse cell types including fibroblasts, fat cell and blood
- Supports and connects other tissues and organs



# Muscle Tissue

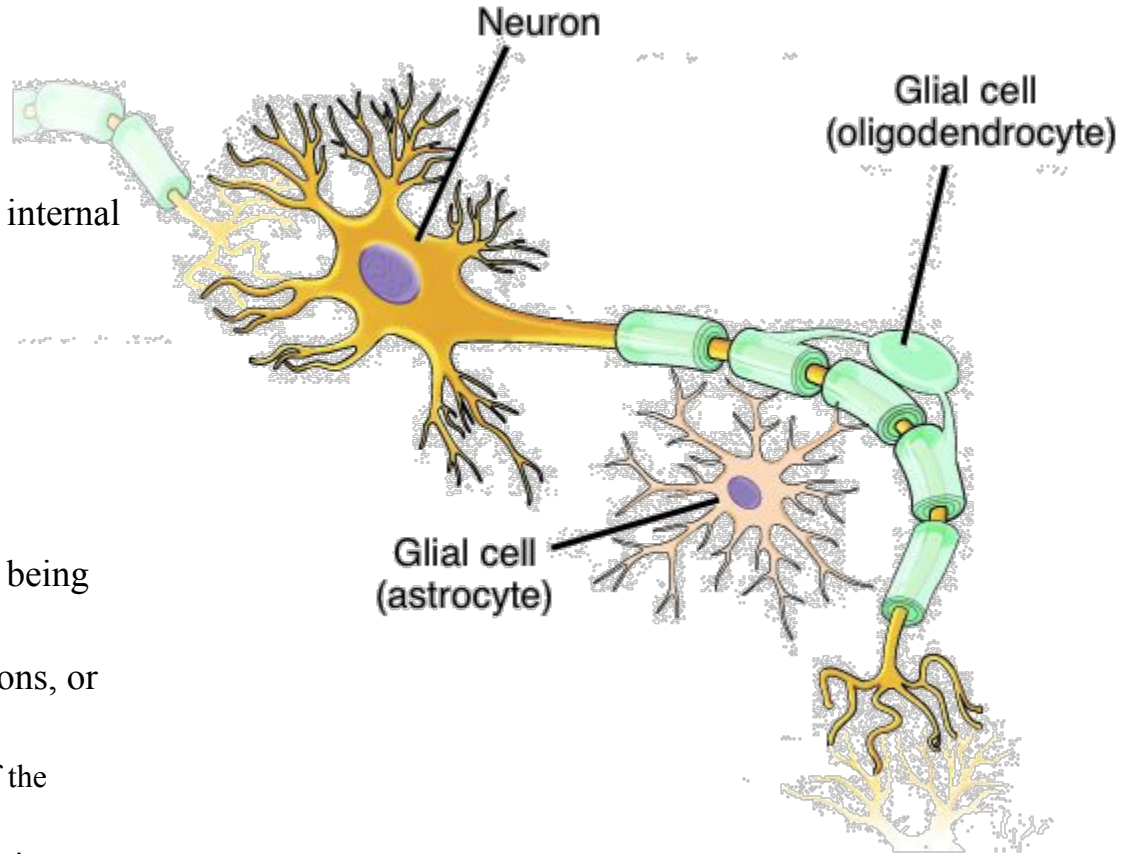
- Essential for keeping the body upright, allowing it to move, and even pumping blood and pushing food through the digestive tract
- Muscle cells, often called muscle fibers
- Cells that are able to contract
- Contain contractile protein myosin and actin filaments
- E.g.
  - Skeletal(Voluntary)
  - Smooth(involuntary)
  - Cardiac(heart)





# Nervous Tissue

- Highly specialized tissue
- involved in sensing stimuli—external or internal cues—and processing and transmitting information
- Allows to move,
- Think,
- Taste
- See
- Experience all functions associated with being alive
- consists of two main types of cells: neurons, or nerve cells, and glia
  - ◆ **neurons** are the basic functional unit of the nervous system
  - ◆ **glia** mainly act to support neuronal function.





# Organ

- Collection of tissues united together to perform a particular function
- E.g.
- Stomach is one organ found within the digestive system consisting of tissues responsible for the storage and digestion of food



Stomach



Liver



Lungs



Brain



Heart



Pancreas



Spleen



Kidneys



eye



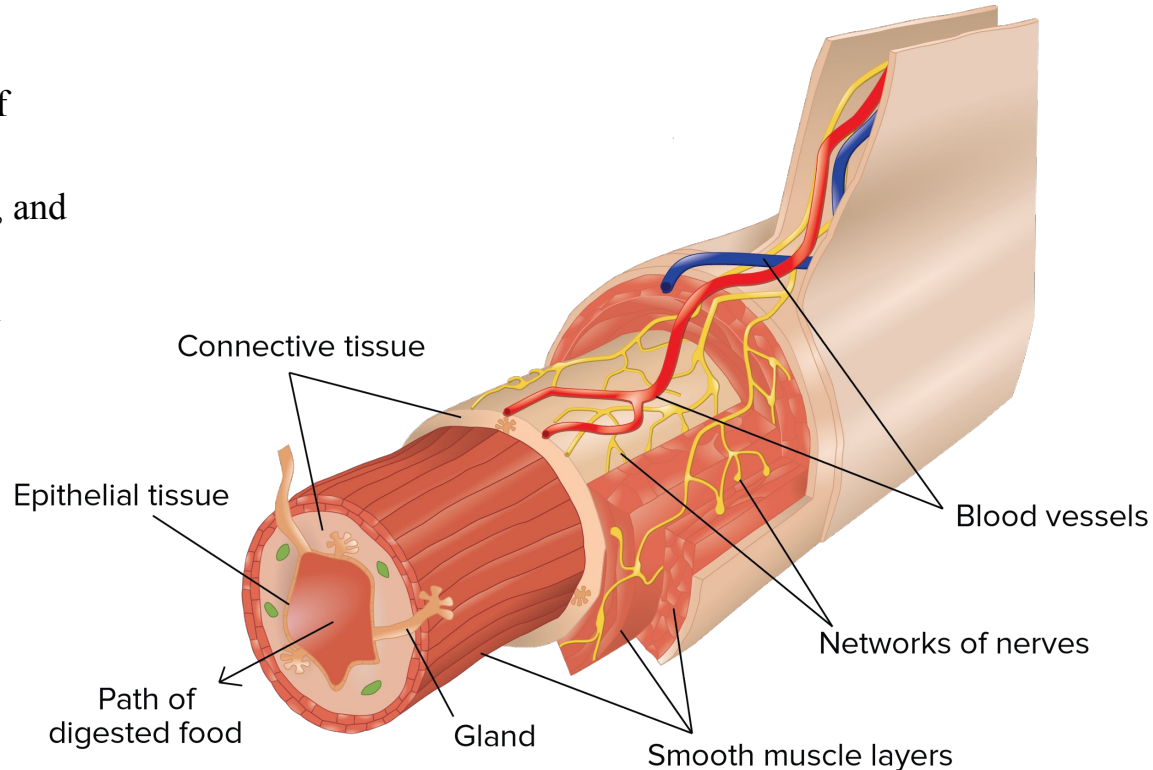


<b>Animal organ</b>	<b>Main tissues</b>	<b>Functions</b>
Heart	Muscle, nerve and blood	Muscular pump for blood circulation
Brain	Blood, nerve	Detection, processing and transmission of information
Liver	Connective, blood	Metabolism of waste material, production of bile and urea and storage of glycogen

<b>Plant organ</b>	<b>Main tissues</b>	<b>Functions</b>
Root	Epidermal and vascular	Absorption of water and nutrients
Stem	Epidermal, vascular and parenchyma	Transport of materials to and from roots
Leaf	Epidermal, mesophyll and vascular	Production of carbs by photosynthesis

# Organ

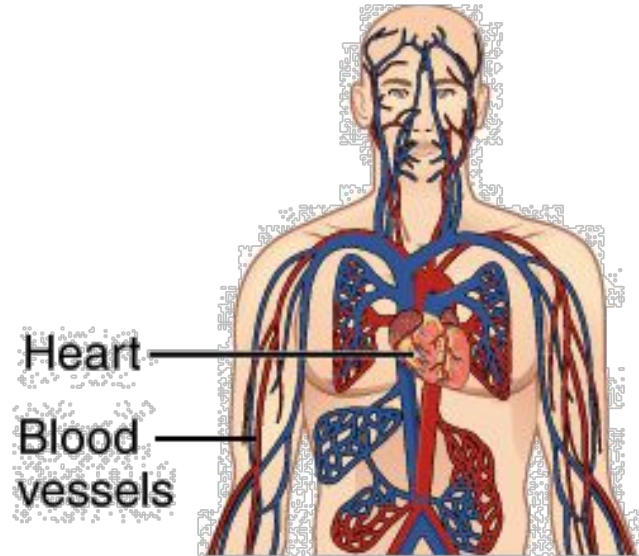
- Most organs contain **all four tissue types**
- The inside of the intestine is lined by **epithelial cells**
- Around the epithelial layer are layers of **connective tissue** and smooth muscle, interspersed with glands, blood vessels, and neurons
- **smooth muscle** contracts to move food through the gut, under the control of its associated networks of **neurons**



# Organ Systems

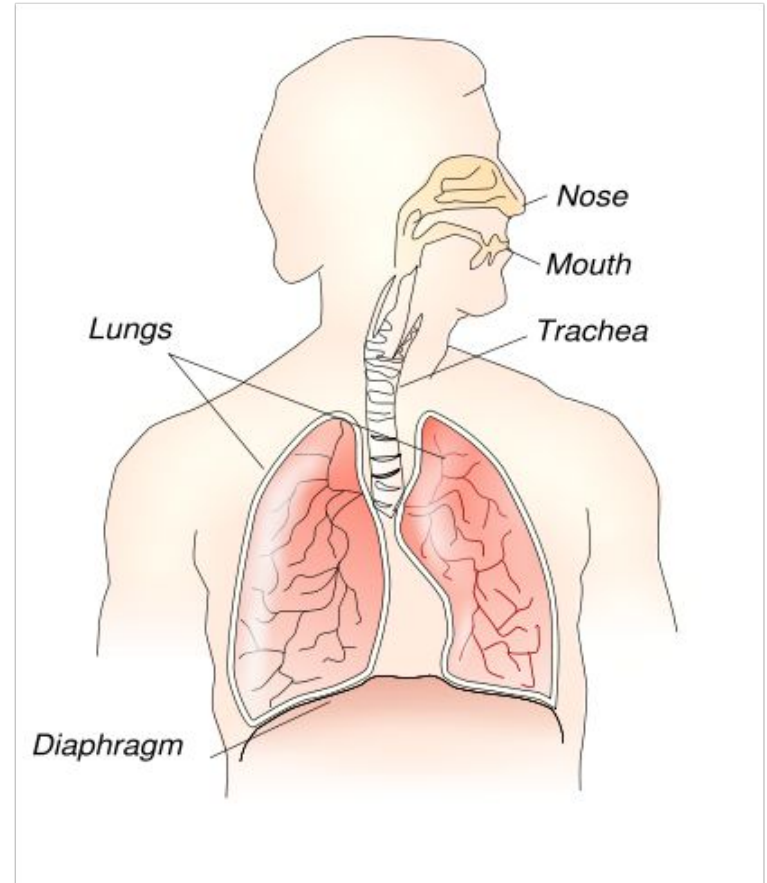
- Organs are grouped into organ systems,
  - They work together to carry out a particular function for the organism
- 
- ✓ The heart and the blood vessels make up the **cardiovascular system**
  - ✓ Work together to circulate the blood, bringing oxygen and nutrients to cells throughout the body and carrying away carbon dioxide and metabolic wastes

## Cardiovascular System



# Organ Systems

- ✓ The **respiratory system** includes the nose, mouth, pharynx, larynx, trachea, and lungs
- ✓ Brings oxygen into the body and gets rid of carbon dioxide.





# Major organ systems of the human body

Organ system	Function	Organs, tissues, and structures involved
Cardiovascular	Transports oxygen, nutrients, and other substances to the cells and transports wastes, carbon dioxide, and other substances away from the cells; it can also help stabilize body temperature and pH	Heart, blood, and blood vessels
Lymphatic	Defends against infection and disease and transfers lymph between tissues and the blood stream	Lymph, lymph nodes, and lymph vessels

# Major organ systems of the human body

Digestive	Processes foods and absorbs nutrients, minerals, vitamins, and water	Mouth, salivary glands, esophagus, stomach, liver, gallbladder, exocrine pancreas, small intestine, and large intestine
Endocrine	Provides communication within the body via hormones and directs long-term change in other organ systems to maintain homeostasis	Pituitary, pineal, thyroid, parathyroids, endocrine pancreas, adrenals, testes, and ovaries.

# Major organ systems of the human body

Integumentary	Provides protection from injury and fluid loss and provides physical defense against infection by microorganisms; involved in temperature control	Skin, hair, and nails
Muscular	Provides movement, support, and heat production	Skeletal, cardiac, and smooth muscles
Nervous	Collects, transfers, and processes information and directs short-term change in other organ systems	Brain, spinal cord, nerves, and sensory organs—eyes, ears, tongue, skin, and nose

# Major organ systems of the human body

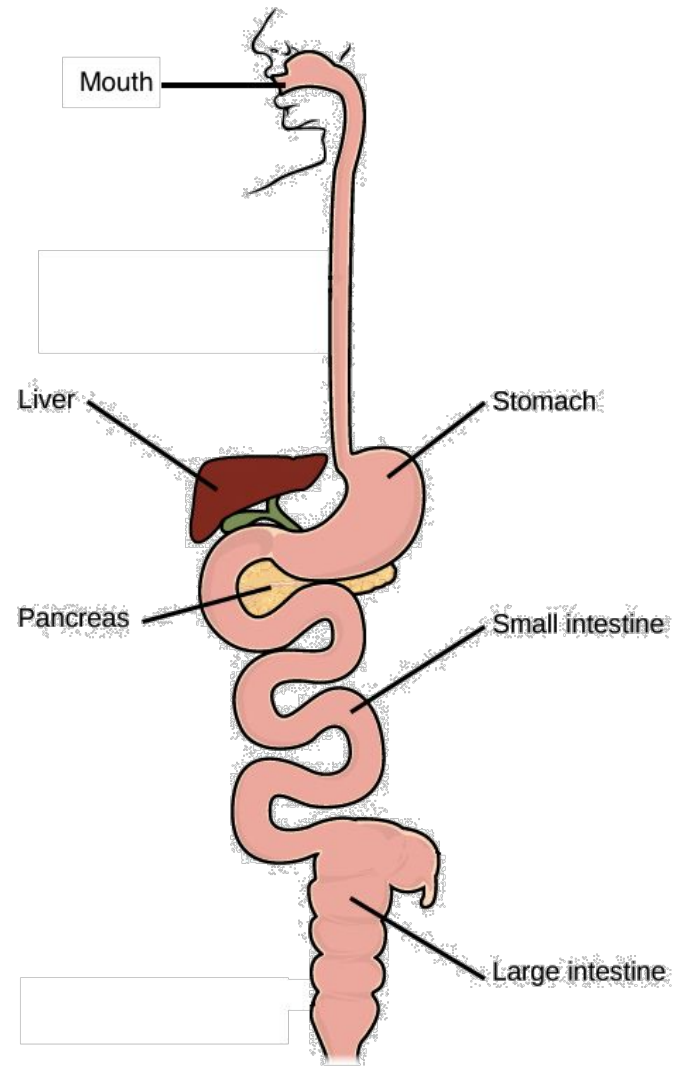
Reproductive	Produces gametes—sex cells—and sex hormones; ultimately produces offspring	Fallopian tubes, uterus, vagina, ovaries, mammary glands (female), testes, vas deferens, seminal vesicles, prostate, and penis (male)
Respiratory	Delivers air to sites where gas exchange can occur	Mouth, nose, pharynx, larynx, trachea, bronchi, lungs, and diaphragm

# Major organ systems of the human body

Skeletal	Supports and protects soft tissues of the body; provides movement at joints; produces blood cells; and stores minerals	Bones, cartilage, joints, tendons, and ligaments
Urinary	Removes excess water, salts, and waste products from the blood and body and controls pH	Kidneys, ureters, urinary bladder, and urethra
Immune	Defends against microbial pathogens—disease-causing agents—and other diseases	Leukocytes, tonsils, adenoids, thymus, and spleen

# Organs in a system work together

- Organ system must work together for the system to function as a whole
- The mouth, stomach, small intestine, and other digestive system organs work together to make digesting food and absorbing nutrients efficient
- Digestion wouldn't work well if your stomach stopped churning or if one of your enzyme-producing glands—like the pancreas—decided to take the day off!



# Organ systems work together as well

- Different organ systems also cooperate to keep the body running
  - For example, the **respiratory system** and the **circulatory system** work closely together to deliver oxygen to cells and to get rid of the carbon dioxide the cells produce
  - The circulatory system picks up oxygen in the lungs and drops it off in the tissues, then performs the reverse service for carbon dioxide
  - The lungs expel the carbon dioxide and bring in new oxygen-containing air
  - Only when both systems are working together can oxygen and carbon dioxide be successfully exchanged between cells and the environment
- 
- ❑ The blood in your **circulatory system** has to receive nutrients from your **digestive system** and undergo filtration in your kidneys, or it wouldn't be able to sustain the cells of your body and remove the wastes they produce

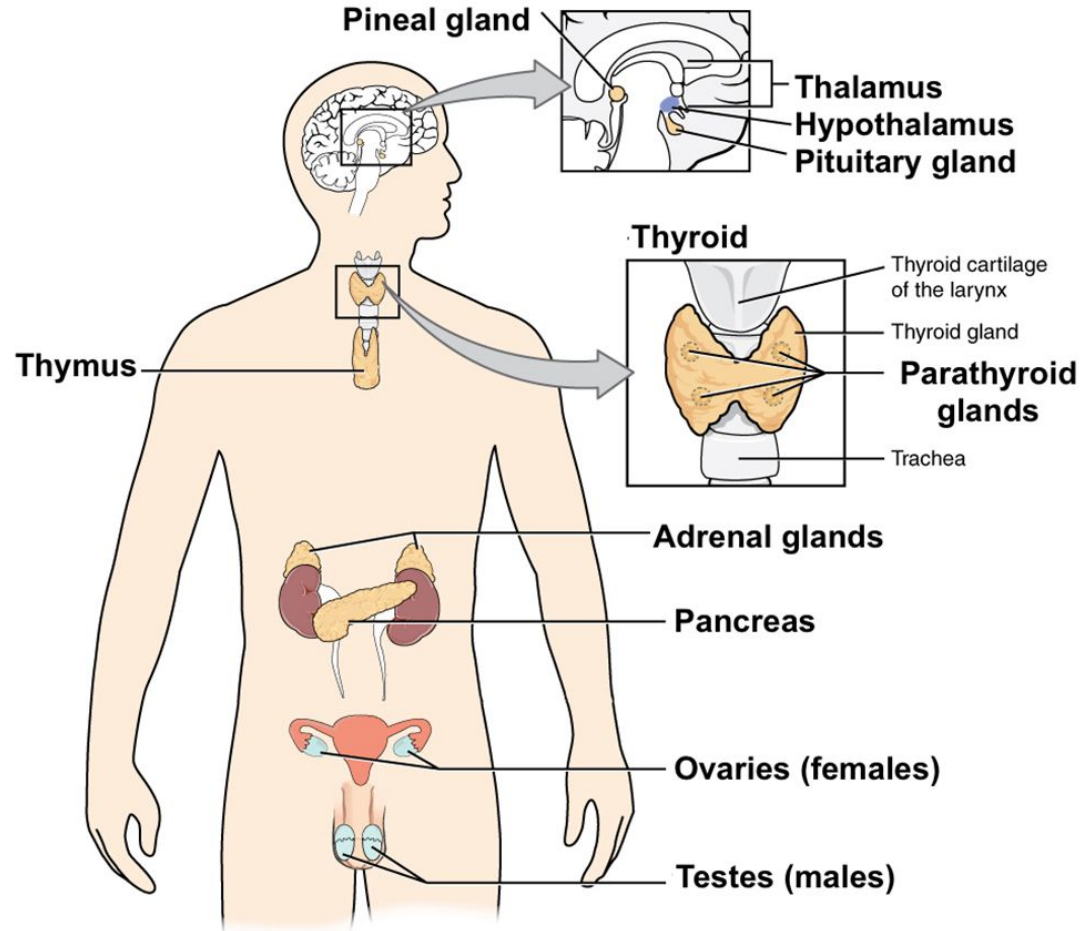


# Control and Coordination

- Many body functions are controlled by the nervous system and the endocrine system
- Use chemical messengers to affect the function of the other organ systems and to coordinate activity at different locations in the body
- The nervous system uses **electrical impulses** to collect, process, and respond to information about the environment
- The endocrine system produces and uses **chemical signals** called **hormones**, which travel through the bloodstream and control the actions of cells and organs

# Gland

- Glands are organs
- They produce and release substances that perform certain functions
- Located throughout the body
- Fall into two types:
  - Endocrine and
  - Exocrine



# Endocrine glands

- part of your endocrine system
- make hormones and release them into the bloodstream
- control a number of important functions in your body, such as:
  - growth and development
  - metabolism
  - mood
  - reproduction

## Examples of glands

- adrenal glands
- pituitary gland
- hypothalamus
- thyroid

There are also organs that contain endocrine tissue and act as glands. These include the:

- pancreas
- kidneys
- ovaries
- testes

# Exocrine glands

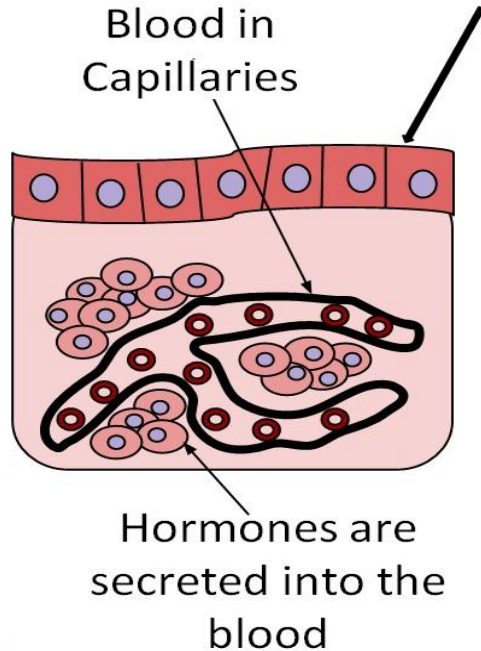
- Produce other substances — not hormones
- Released through ducts to the exterior of your body
  - regulate your body temperature,
  - protect your skin and eyes, and
  - mothers feed babies by producing breast milk.

## Examples of glands

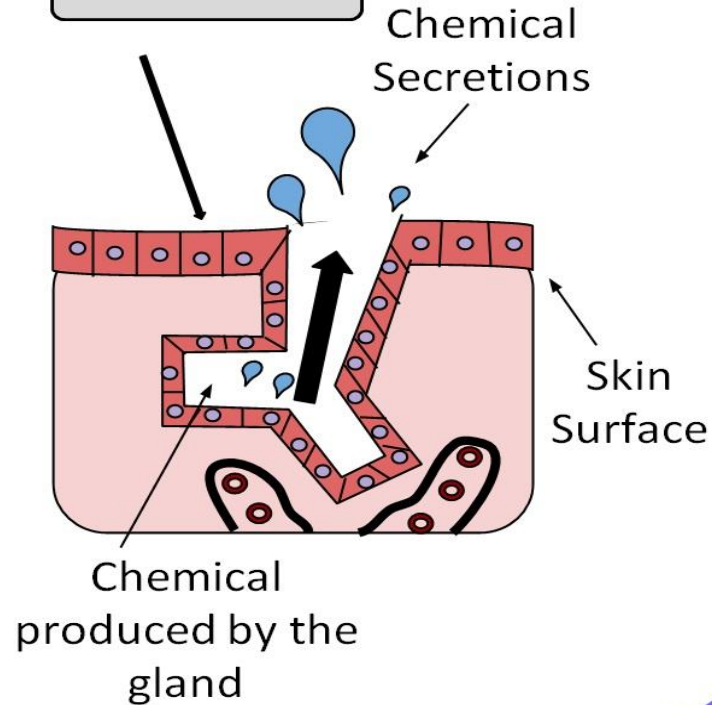
- salivary
- sweat
- mammary
- sebaceous
- lacrimal

## ENDOCRINE GLANDS Vs EXOCRINE GLANDS

### Endocrine



### Exocrine



## DIFFERENCE BETWEEN EXOCRINE GLAND AND ENDOCRINE GLAND

ENDOCRINE GLANDS	EXOCRINE GLANDS
<b>Ducts</b>	
Endocrine glands do not have ducts	Exocrine glands have ducts
<b>Secretory Products</b>	
Hormones	Sweat, enzymes, mucus, sebum
<b>Route of Secretion</b>	
Secretory product released directly into the bloodstream, eventually reaching the target organ	Secretory products are released to an internal organ or the external surface through a duct
<b>Example</b>	
Thyroid glands, parathyroid glands, pituitary glands, adrenal glands	Salivary glands, pancreas, liver, Brunner's glands, oesophageal glands

# Common Glands and Hormones

Hormone	Gland produced in	Role
Thyroid hormone	Thyroid	Regulates metabolism
Adrenaline (epinephrine)	Adrenal gland	Involved in "fight or flight" response
Cortisol	Adrenal gland	Involved in "fight or flight" response, regulates metabolism and immune responses

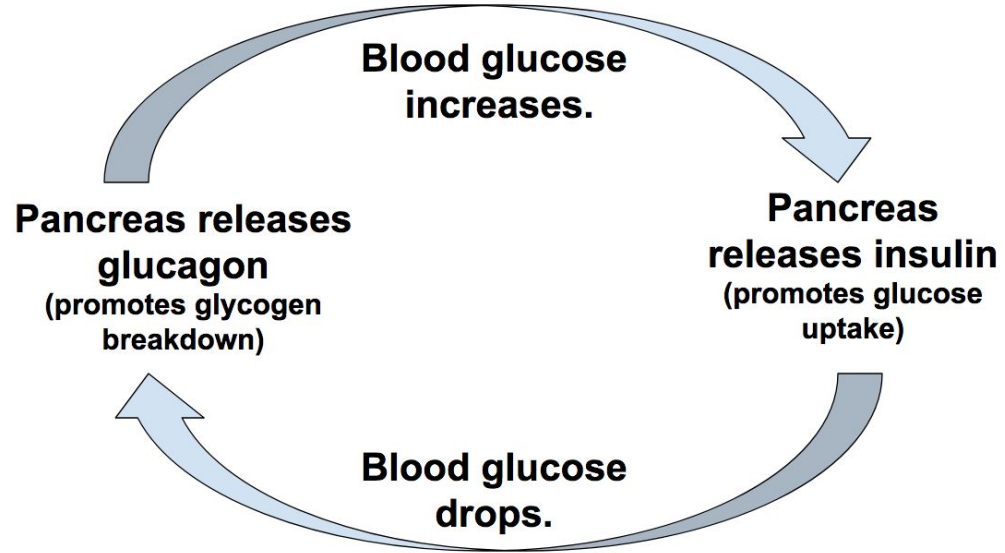


# Common Glands and Hormones

Hormone	Gland produced in	Role
Estrogen	Ovaries	Sexual and reproductive development, mainly in women
Testosterone	Testes, sometimes adrenal glands or ovaries	Sexual and reproductive development, mainly in men
Insulin	Pancreas	Blood sugar regulation, fat storage
Glucagon	Pancreas	Blood sugar regulation

# Who regulates THE REGULATORS?

- The endocrine system is regulated by **negative feedback** mechanisms that work to maintain **homeostasis**.
- 
- For example, blood glucose regulation



Thank You