

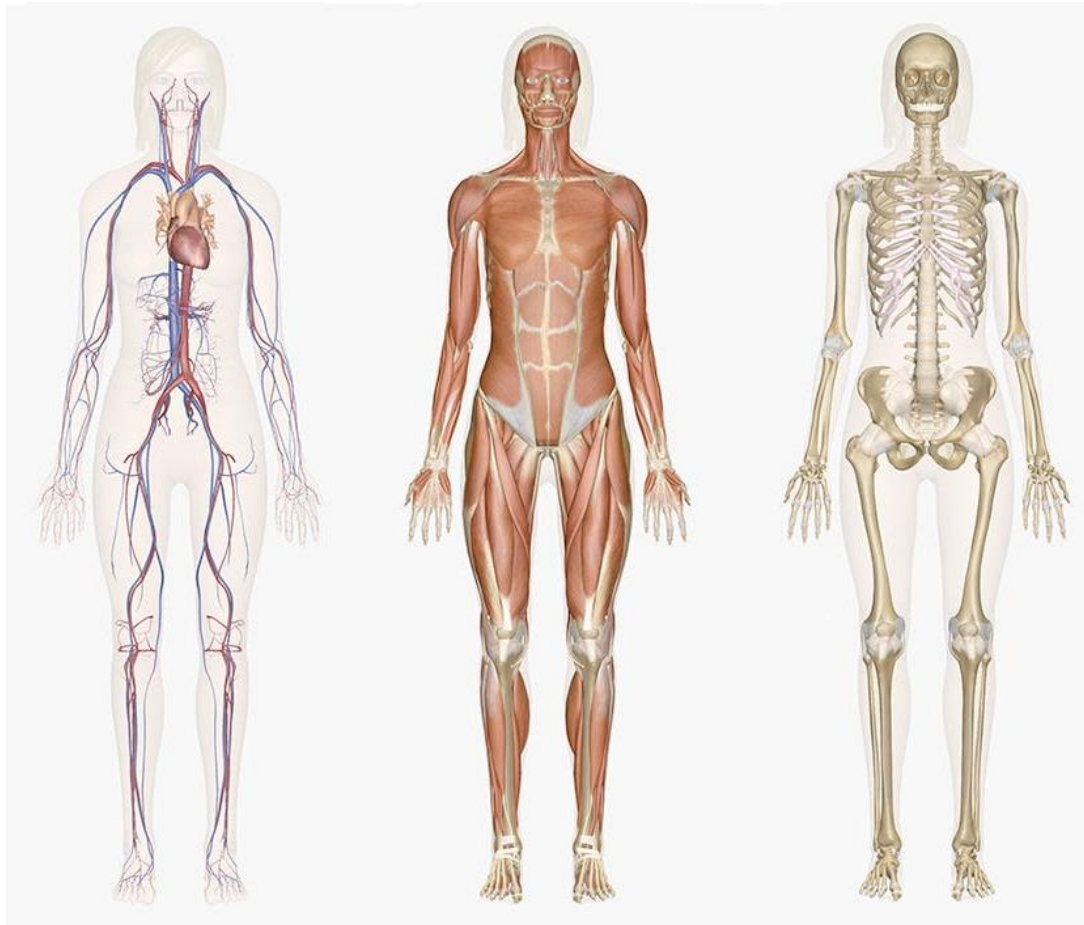
Go to the “**Slide Show**”
shade above

Click on “**Play from Beginning**”

Human Anatomy and Physiology

Skin, Muscle, Bone

Chapter 30





List as many muscles in your body as you can.

List as many bones in your body as you can.

What is the function of skin?



List as many muscles in your body as you can.

Bicep, tricep, quads, hamstrings, gluteus, deltoids, pects

List as many bones in your body as you can.

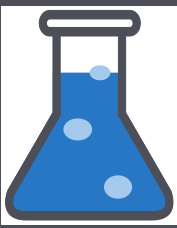
cranium, femur, tibia, fibula, vertebrae, sternum, rib cage, humorous

What is the function of skin?

protection, regulates body temperature



Lesson Objectives



By the end of this lesson, you should be able to:

- Recognize the hierarchy of levels of organization for humans (cells, tissues, organs, systems).
- Identify characteristics and define the purpose of the four types of human tissues, emphasizing:
 - Skin (Epithelial tissue)
 - Skeleton (Connective tissue)
 - Muscle tissue
 - Nervous tissue (next lesson)
- Understand how Organ Systems work together to perform life's functions.
- Describe regulation of the internal environment (homeostasis).
- **Science Practice: Labelling Skin, Muscle, and Bones**

Human Anatomy & Physiology

Anatomy:

Study of Structure

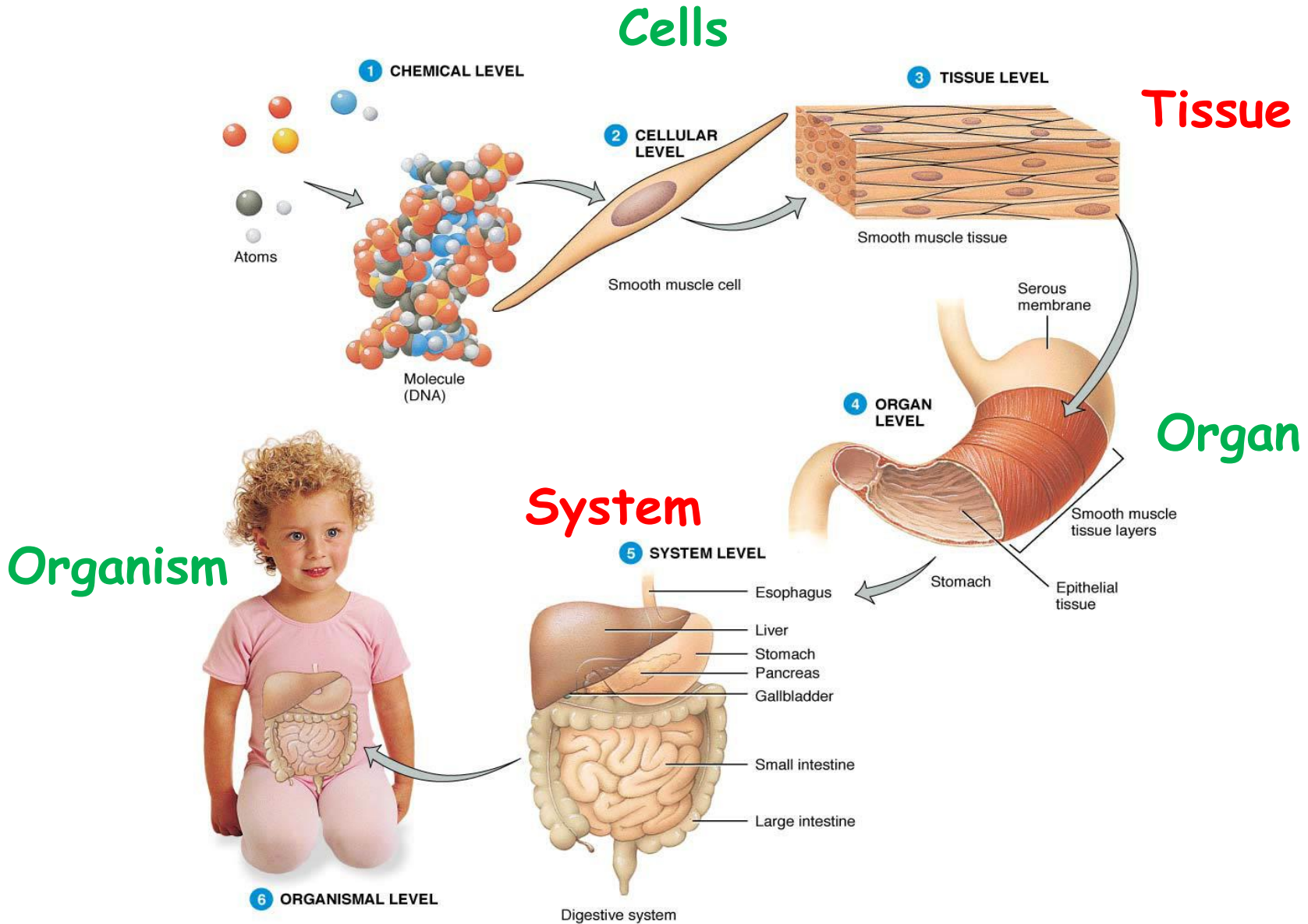
Physiology:

Study of Function

“Structure fits
Function”



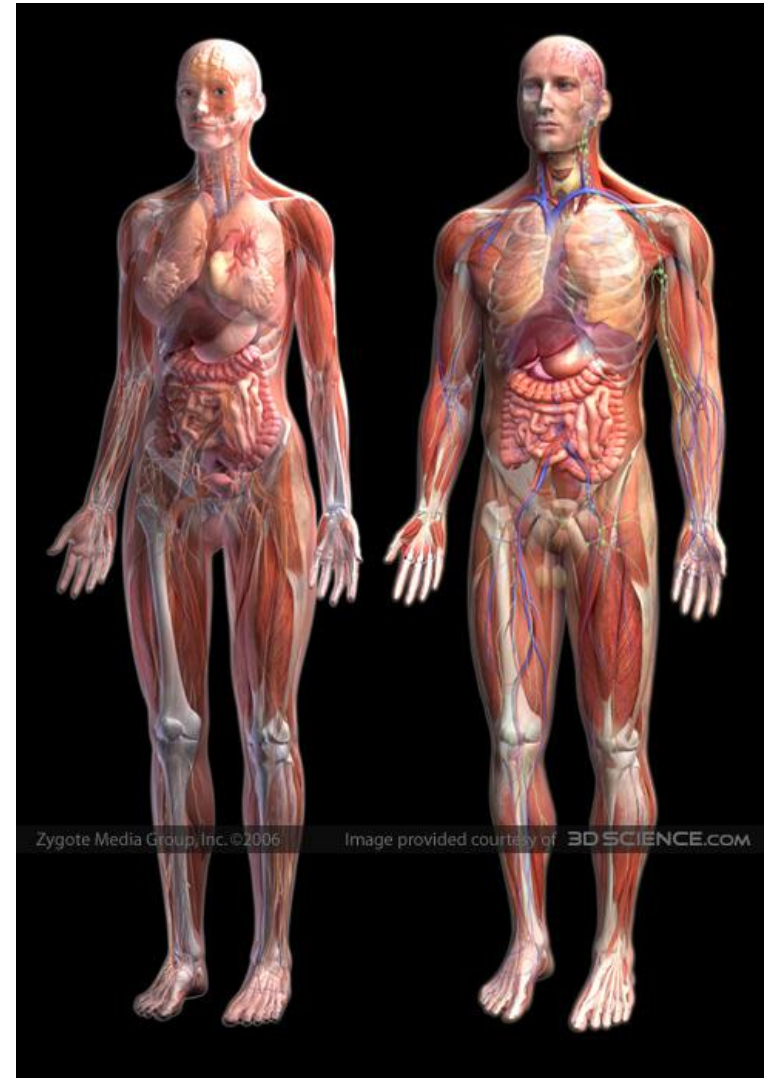
The Human Body consists of a **HIERARCHY** of levels of organization:



Human Being

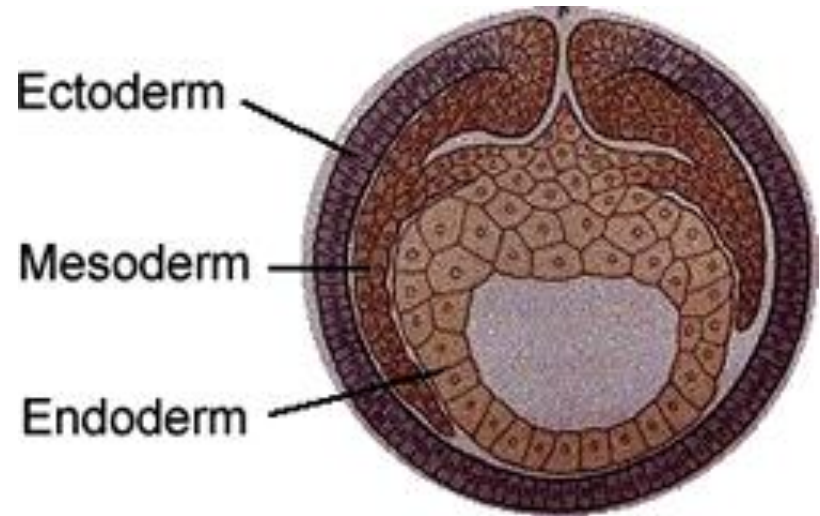
“...fearfully
and wonderfully
made.”

(Psalm 139:14)



Germ Layers

“Triploblastic”



GERM LAYER DERIVATIVES

ECTODERM

brain
spinal cord
nerves
skin
nails
hair

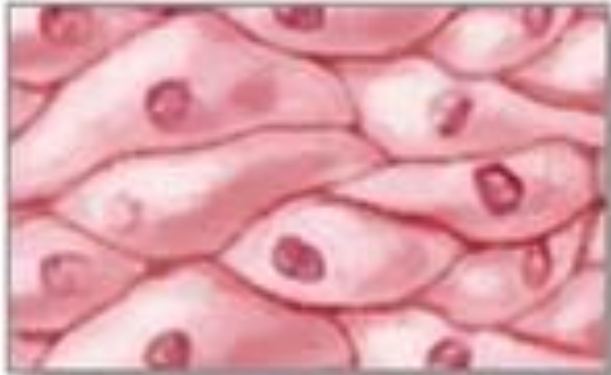
MESODERM

heart
kidneys
bones
cartilage
muscles
blood cells
blood vessels

ENDODERM

lining of the
respiratory system
lining of the
digestive tract
liver
pancreas
bladder

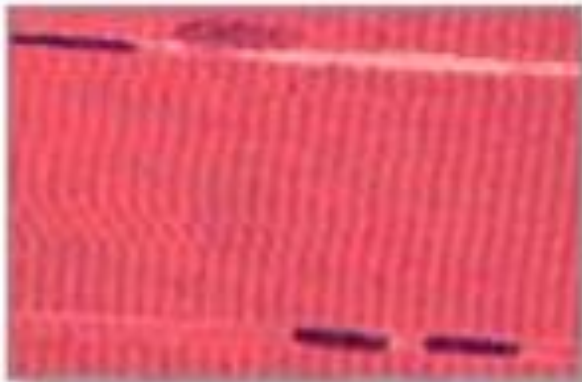
4 Main Types of Tissues



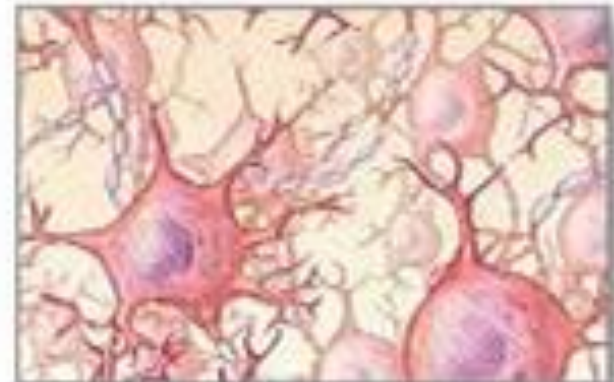
Epithelial tissue



Connective tissue



Muscle tissue

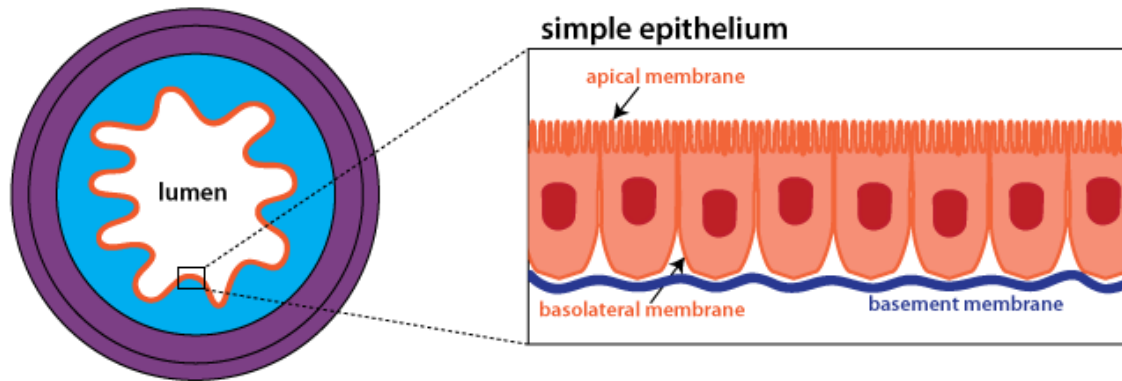


Nervous tissue

Epithelial Tissue

Cover body surfaces, lining internal organs & cavities.

- **Apical** cells face the interior cavity.



Epithelial cells come in three shapes:

1. **Squamous**, like a fried egg.
2. **Cuboidal**, as tall as they are wide.
3. **Columnar**, taller than they are wide.

Epithelial Cells

Single Squamous Epithelium

Ciliated Columnar Epithelium

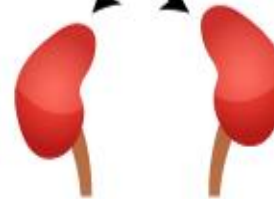
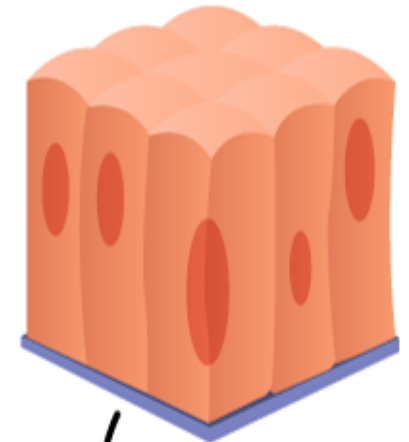
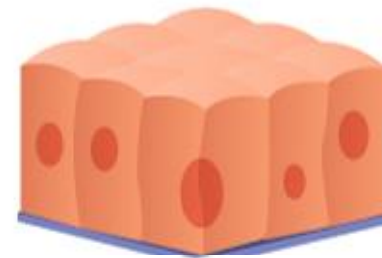
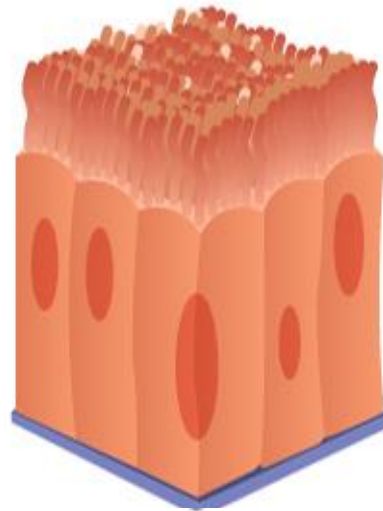
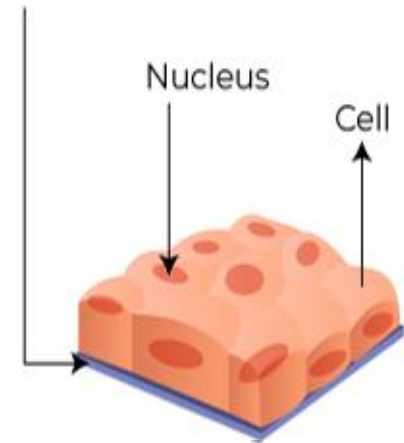
Simple Cuboidal Epithelium

Simple (smooth) Columnar Epithelium

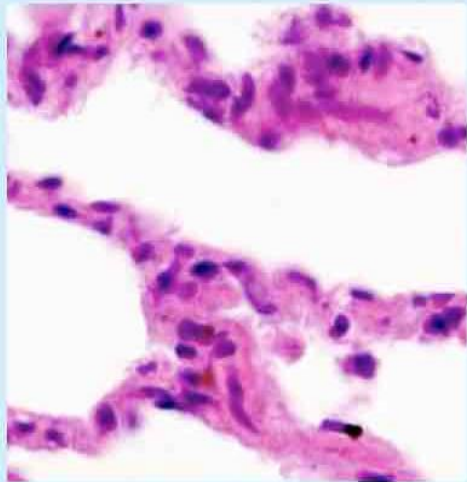
Basement Membrane

Nucleus

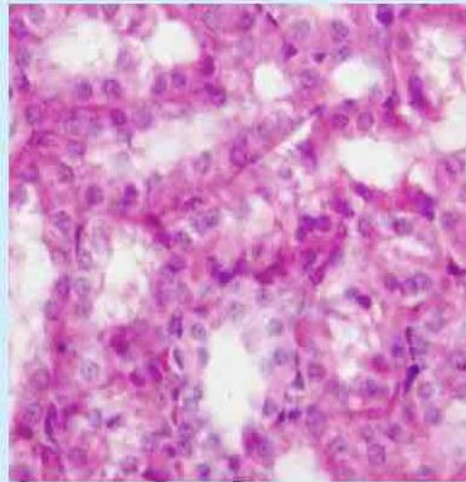
Cell



8 TYPES OF EPITHELIAL TISSUES



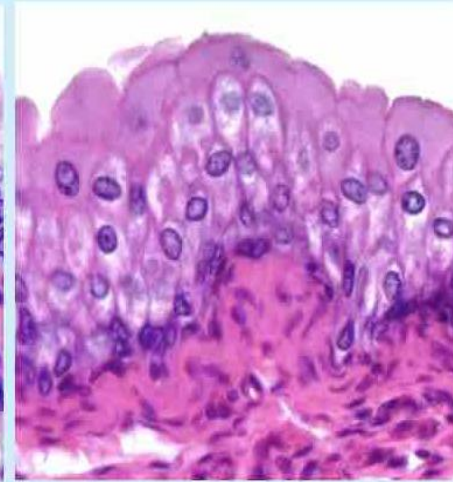
Simple Squamous
(Alveoli)



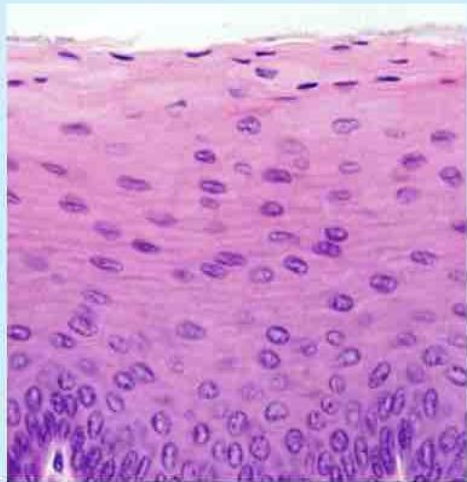
Simple Cuboidal
(Kidney)



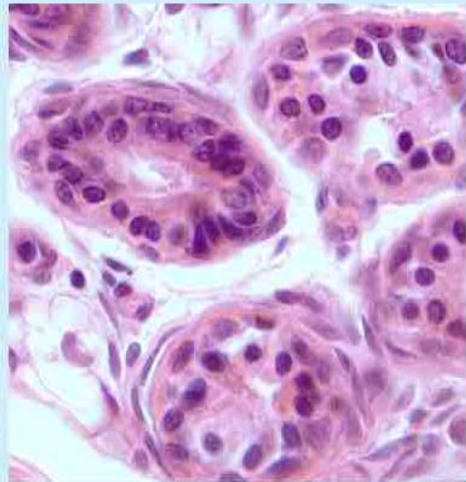
Simple Columnar
(Stomach)



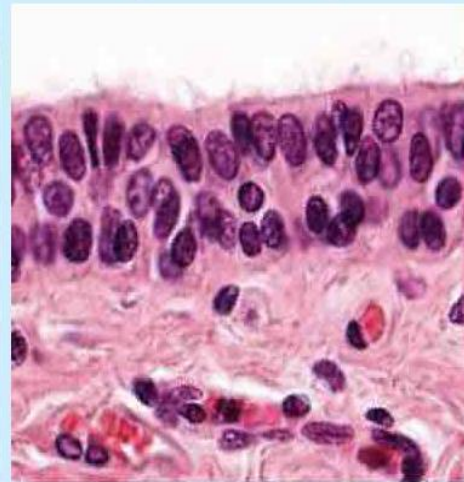
Transitional
(Bladder)



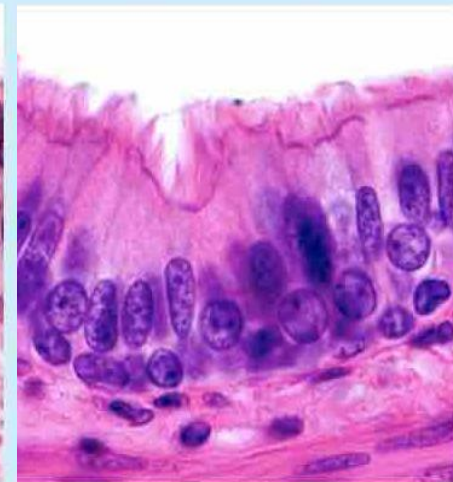
Stratified Squamous
(Esophagus)



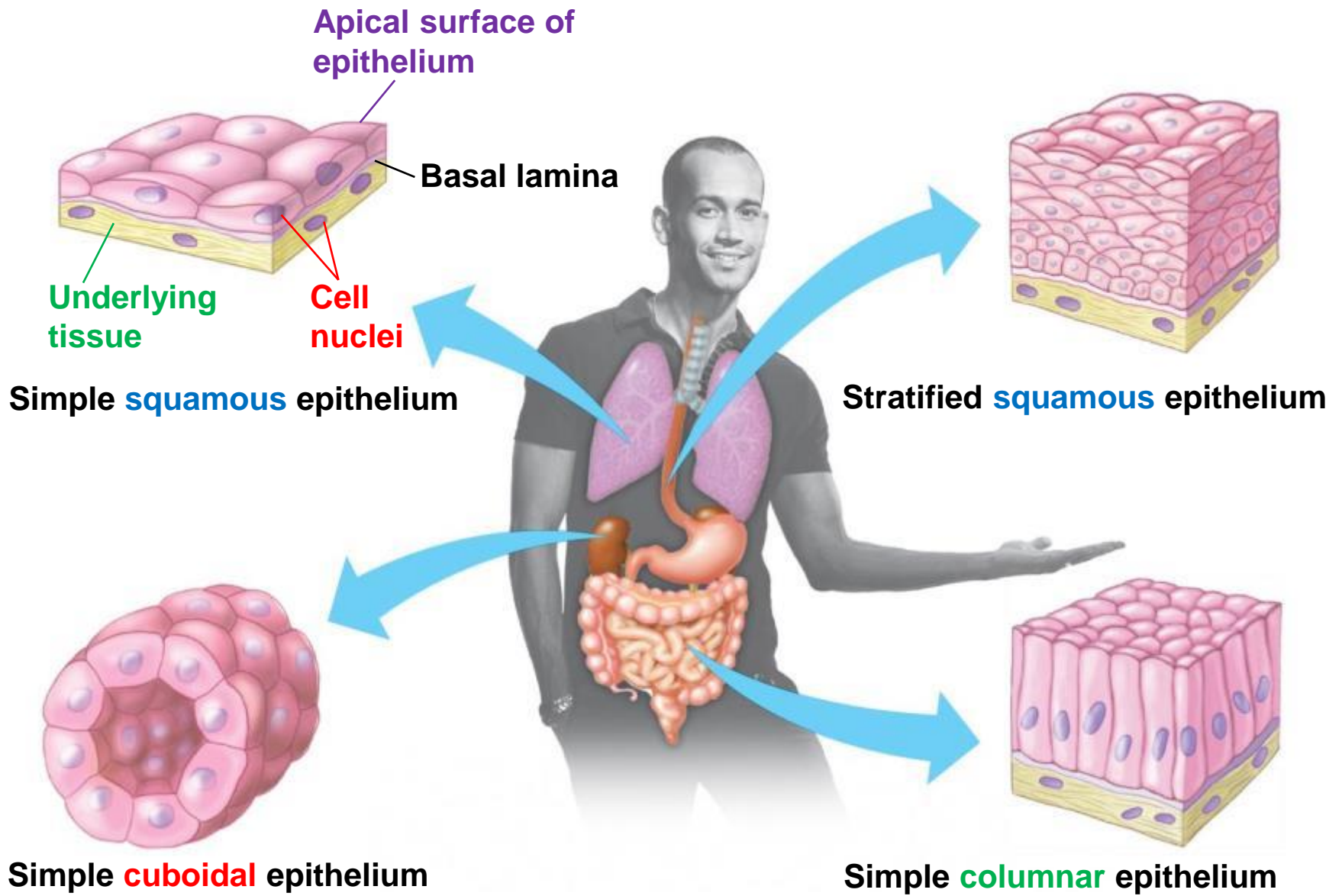
Stratified Cuboidal
(Sweat gland)



Stratified Columnar
(Salivary duct)

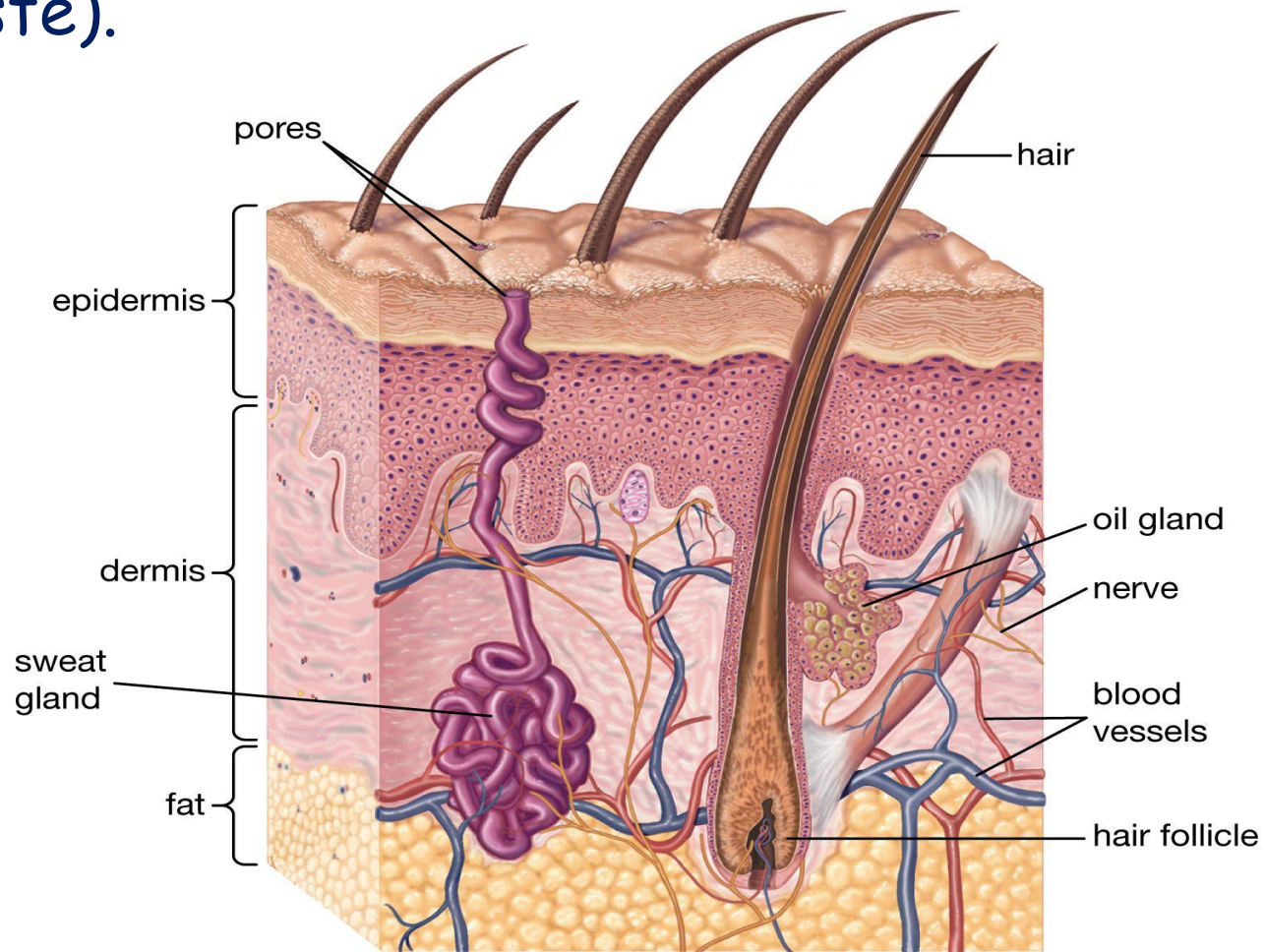


Pseudostratified
Columnar (Trachea)

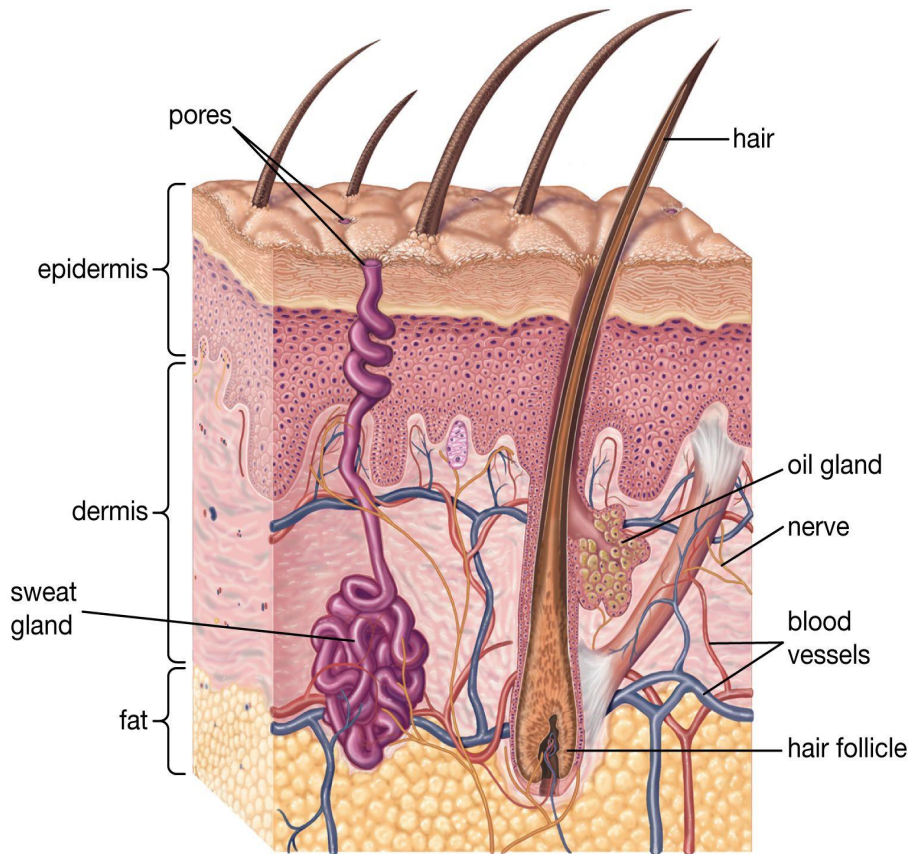


Epithelial Tissue: SKIN

Part of integumentary system. Skin **protects** internal organs, **regulates body temperature**, and **excretes sweat** (liquid waste).



Epithelial Tissue: SKIN



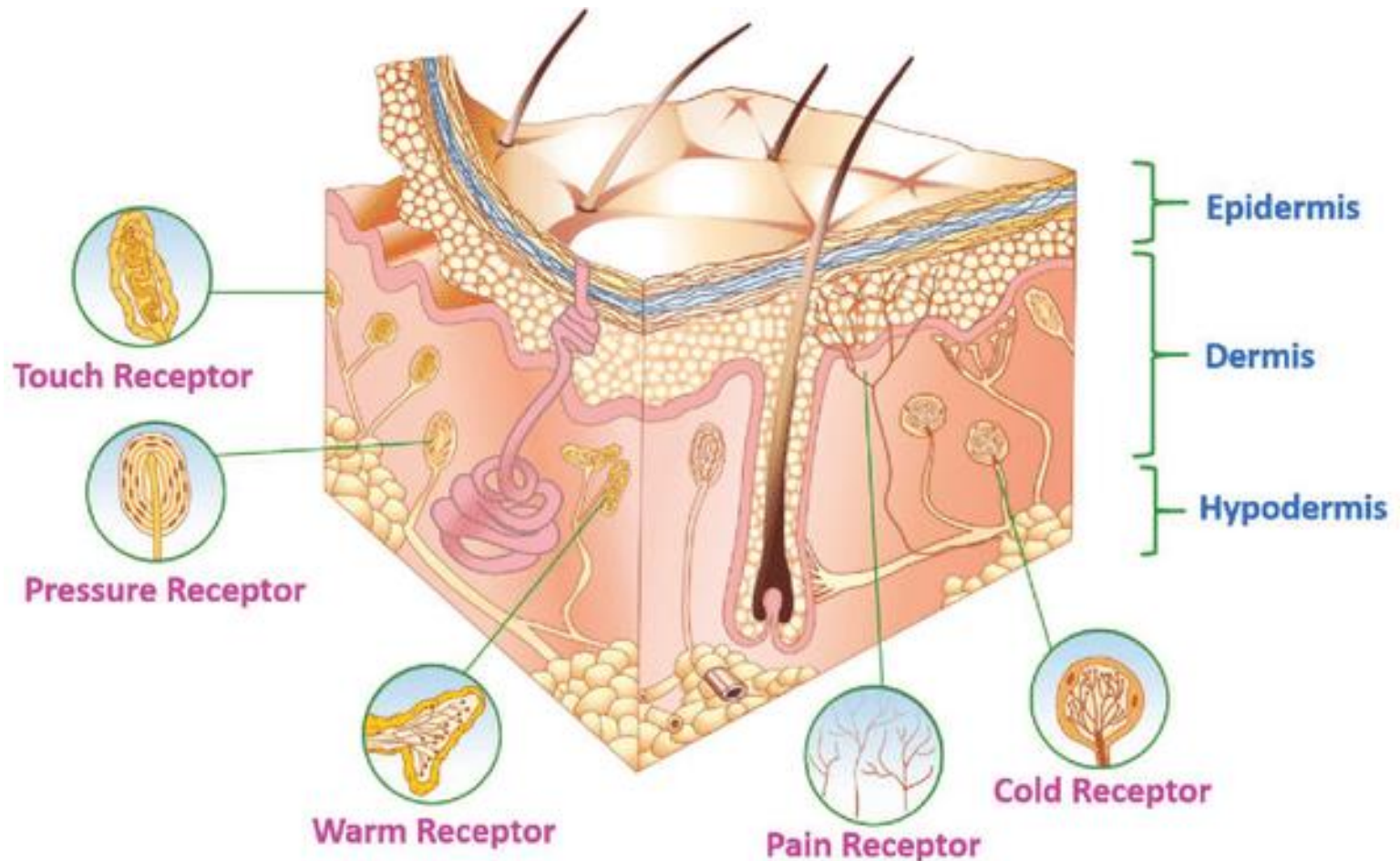
Skin **oil** protects from pathogens (bacteria, fungi) & hydrates the skin.

Sweat glands control body temperature (forehead, armpits, palms, soles).

Skin **pigmentation** is determined by melanin.

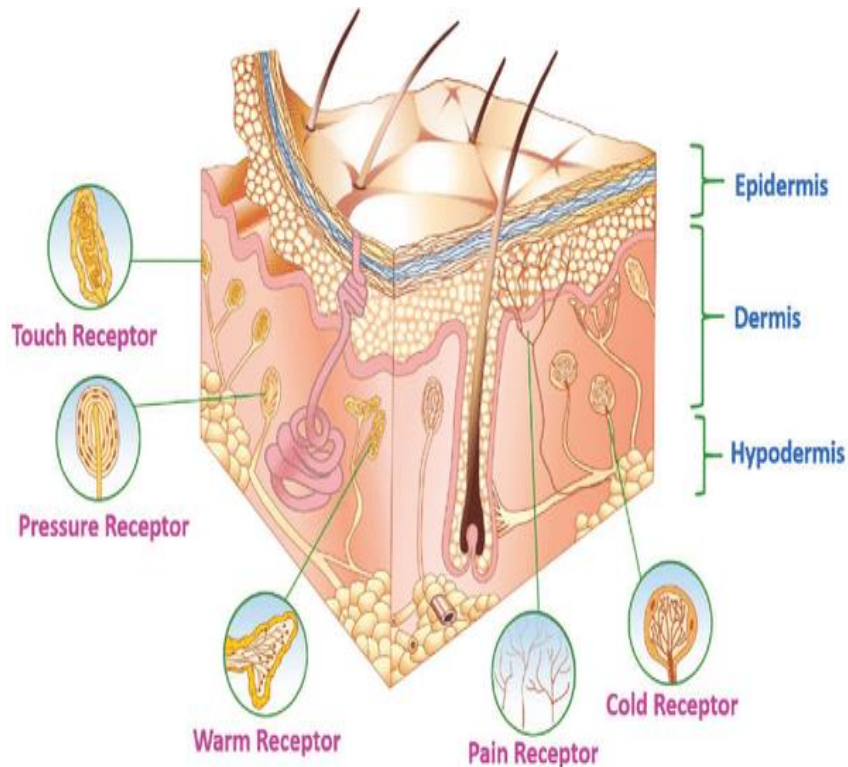
Hair serves as protection (from sun), sensory input & detection, thermoregulation, communication, and beauty.

Epithelial Tissue: SKIN



Special sensory cells in the **DERMIS** detect pain, heat, cold, pressure and touch.

Epithelial Tissue: SKIN



The **heat** receptors are near the sweat glands.

Cold and touch receptors are near the hair follicle ("goose bumps").

Pain receptors are embedded in the fat layer.

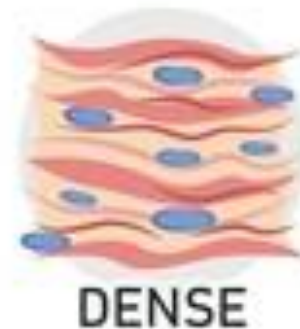
Touch, **pain**, and **cold** are nearer the epidermis while **pressure** receptors are deeper in the dermis.

Connective Tissue

Binds and supports other tissues

Six major types:

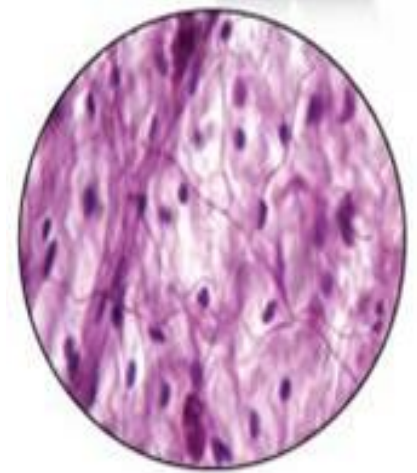
TYPES OF CONNECTIVE TISSUE



Connective Tissue binds and supports other tissues

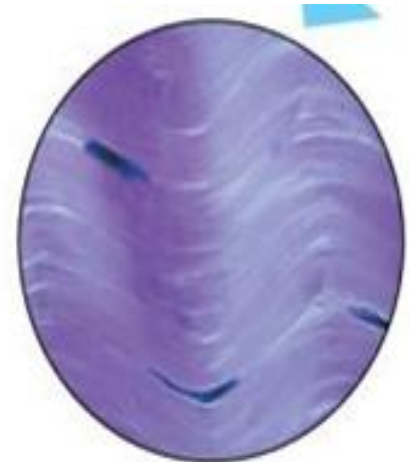
1. Loose Connective Tissue

- is the most widespread.
- consists of ropelike collagen and elastic fibers that are strong and resilient.
- helps to join skin to underlying tissues.



2. Fibrous Connective Tissue

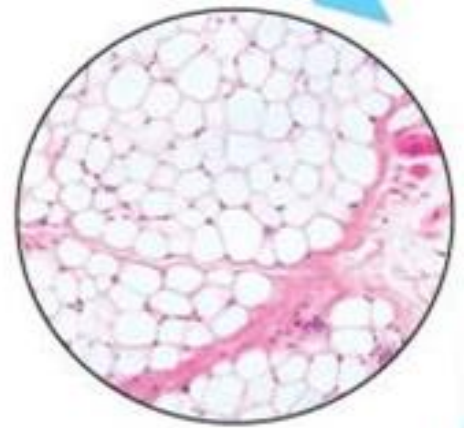
- has **DENSELY** packed collagen fibers.
- forms **Tendons** that attach muscle to bone



Connective Tissue binds and supports other tissues

3. Adipose Tissue

- stores **fat** in large, closely packed cells held in a matrix of fibers.



4. Cartilage

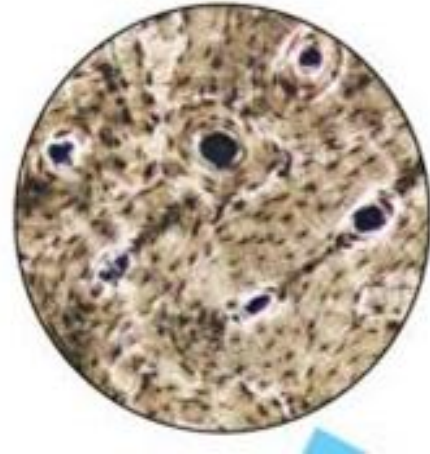
- is a strong and flexible skeletal material.
- commonly surrounds the **ends of bones**.



Connective Tissue binds and supports other tissues

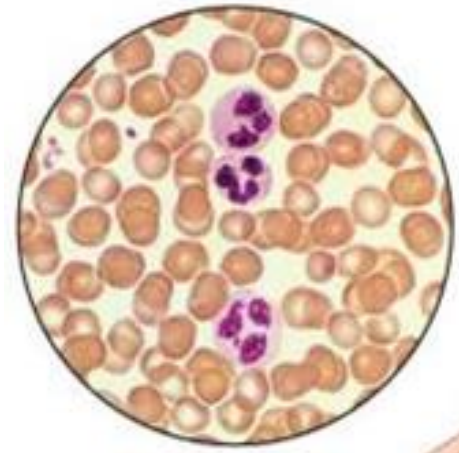
5. Bone

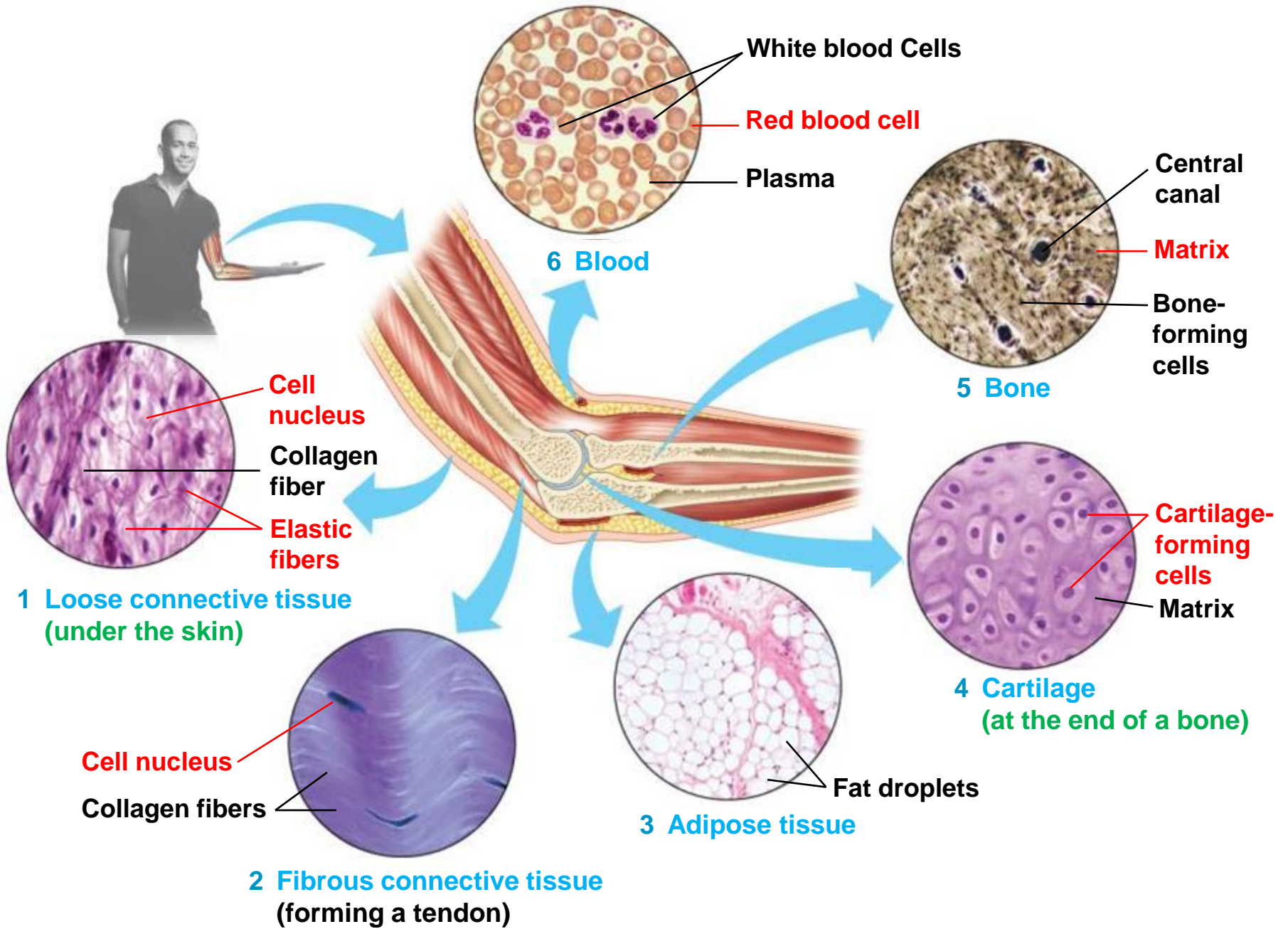
- Osteoblasts secrete collagen fibers embedded in a hard mineral substance containing calcium, magnesium, and phosphate.



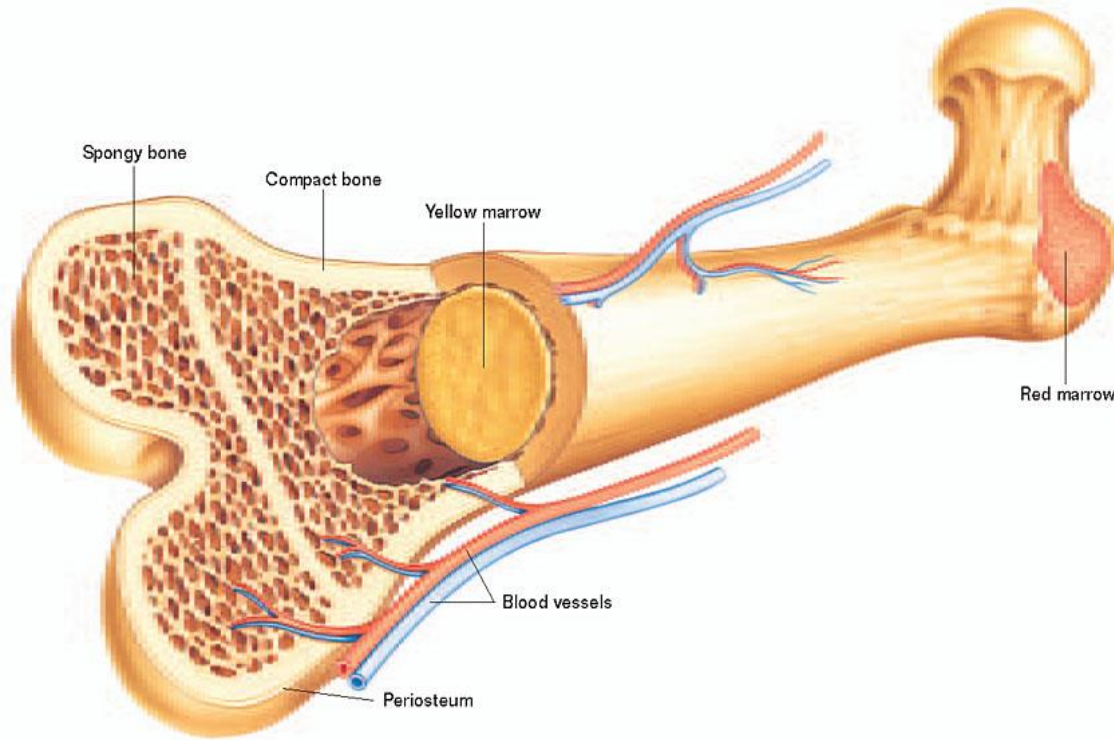
6. Blood

- transports substances throughout the body.





Connective Tissue: Skeleton



Periosteum

Soft, thin covering;
protection.

Compact Bone

Touch, hard; regrows.

Spongy Bone

Contains red marrow;
red blood cells (RBC's).

Marrow

Soft, inner center;
blood vessels, fat.

Red Bone Marrow

Red & White blood cells, platelets.

Yellow Bone Marrow

Fat & mineral storage, stem cells →
cartilage, fat, bone cells.

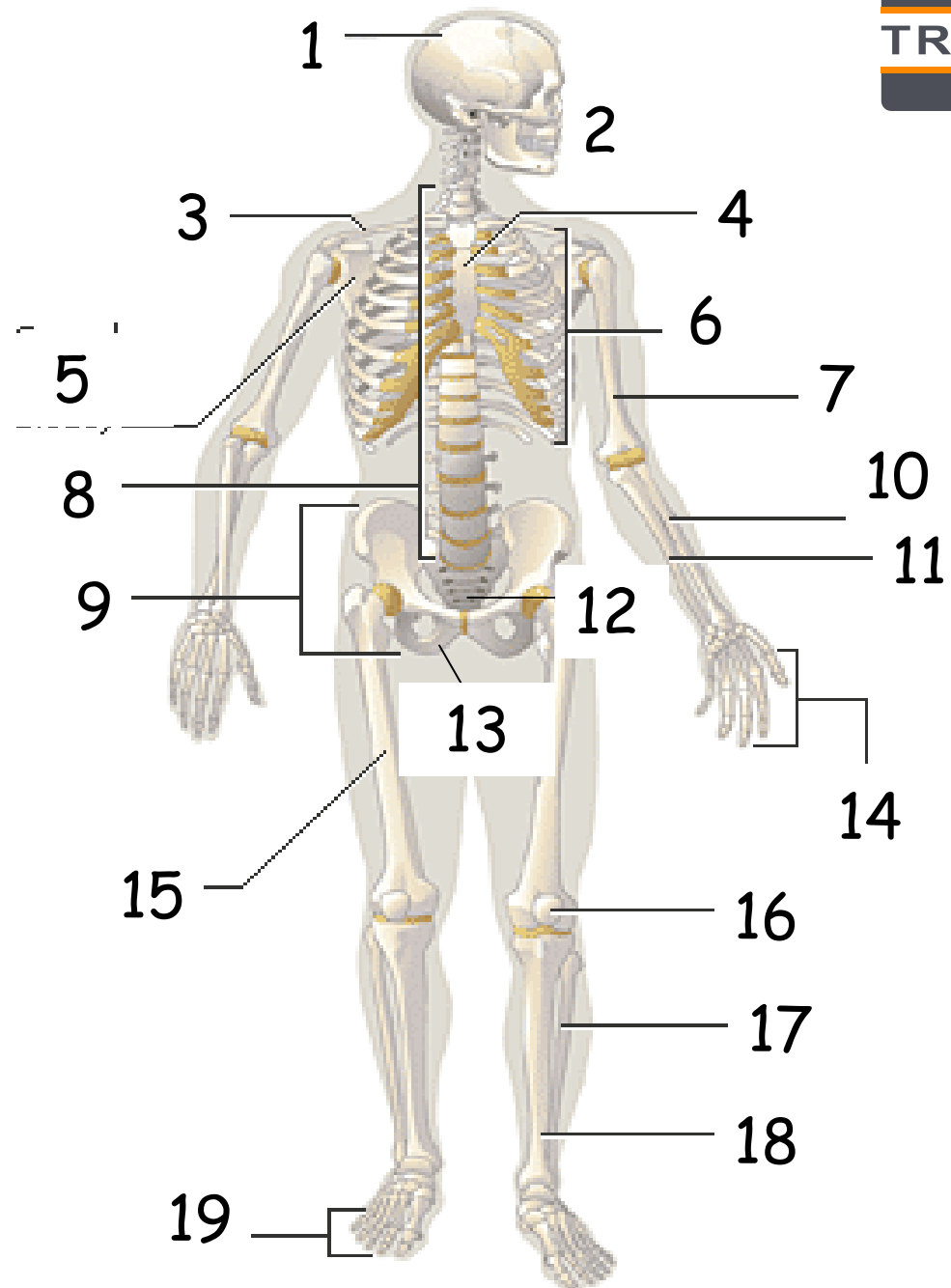
Connective Tissue: Skeleton

TRY IT

The skeletal system works as a support structure for the body.

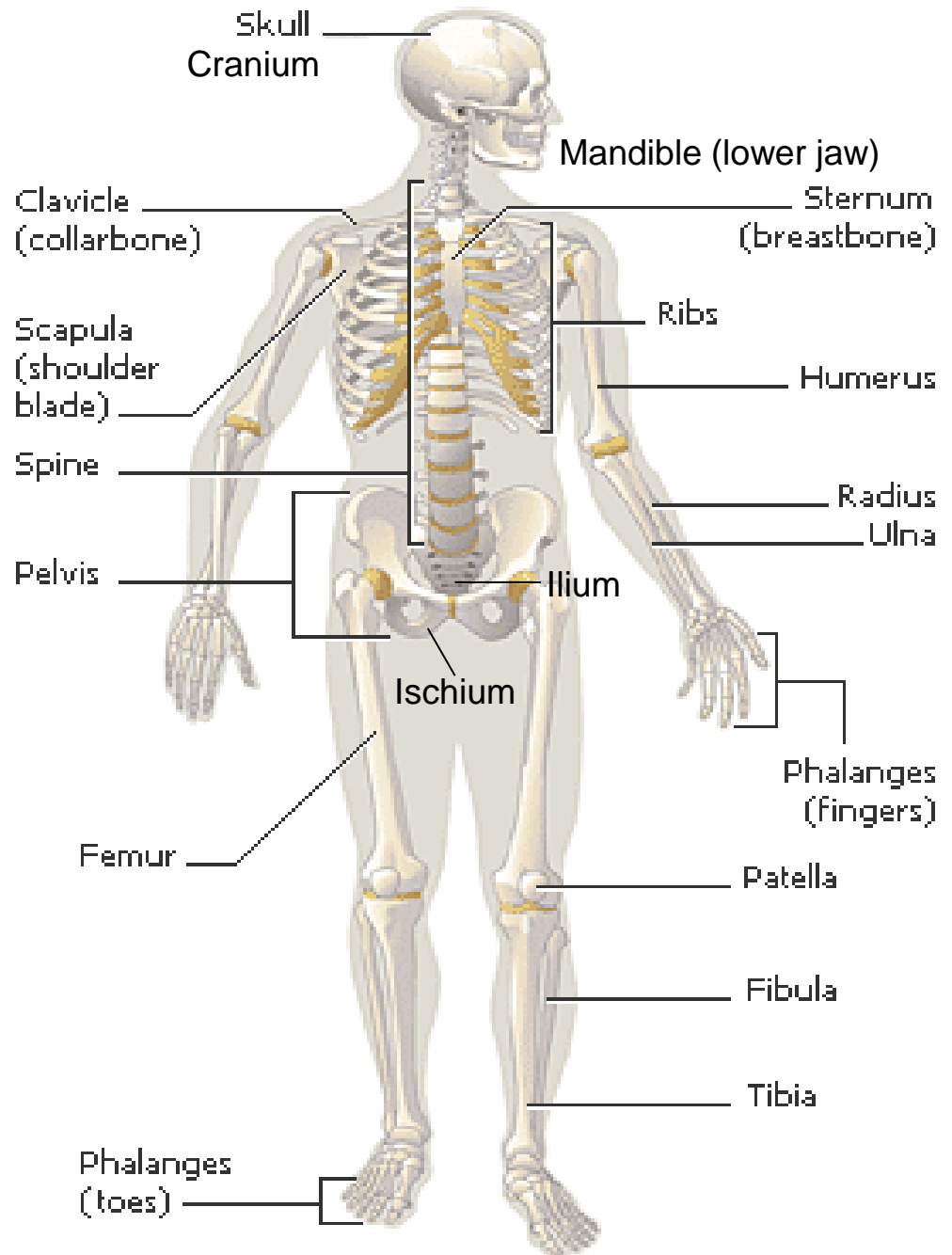
It gives the body its shape, allows movement, makes blood cells, provides protection for organs and stores minerals.

The skeletal system is also called the musculoskeletal system.



Connective Tissue: Skeleton

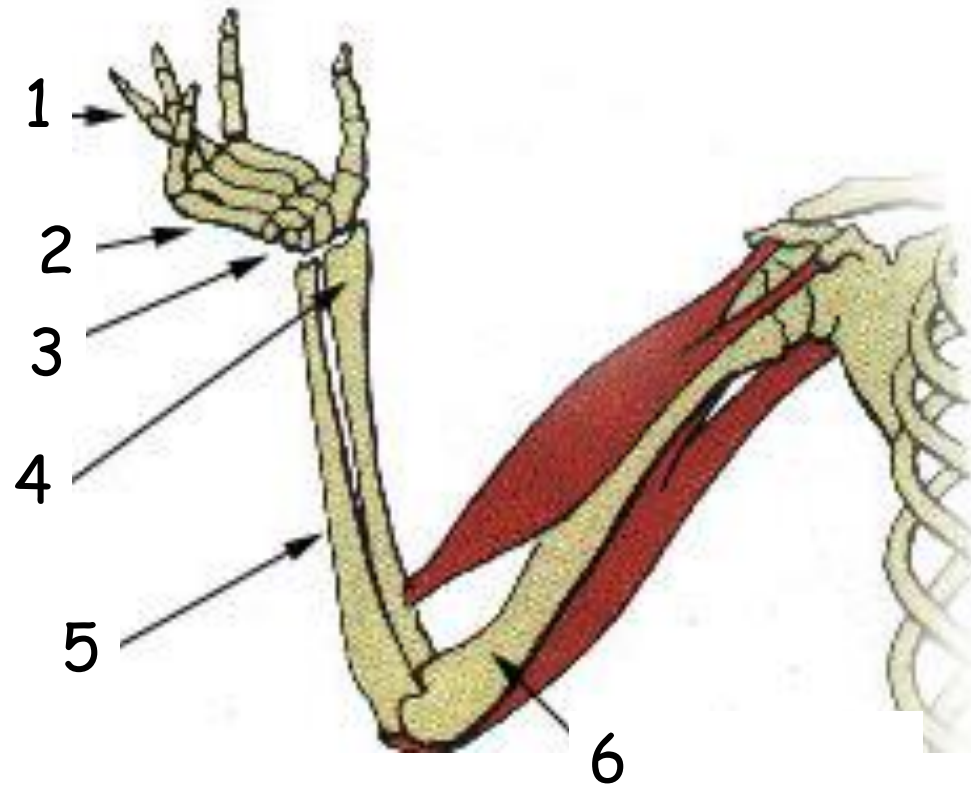
TRY IT



Connective Tissue: Skeleton



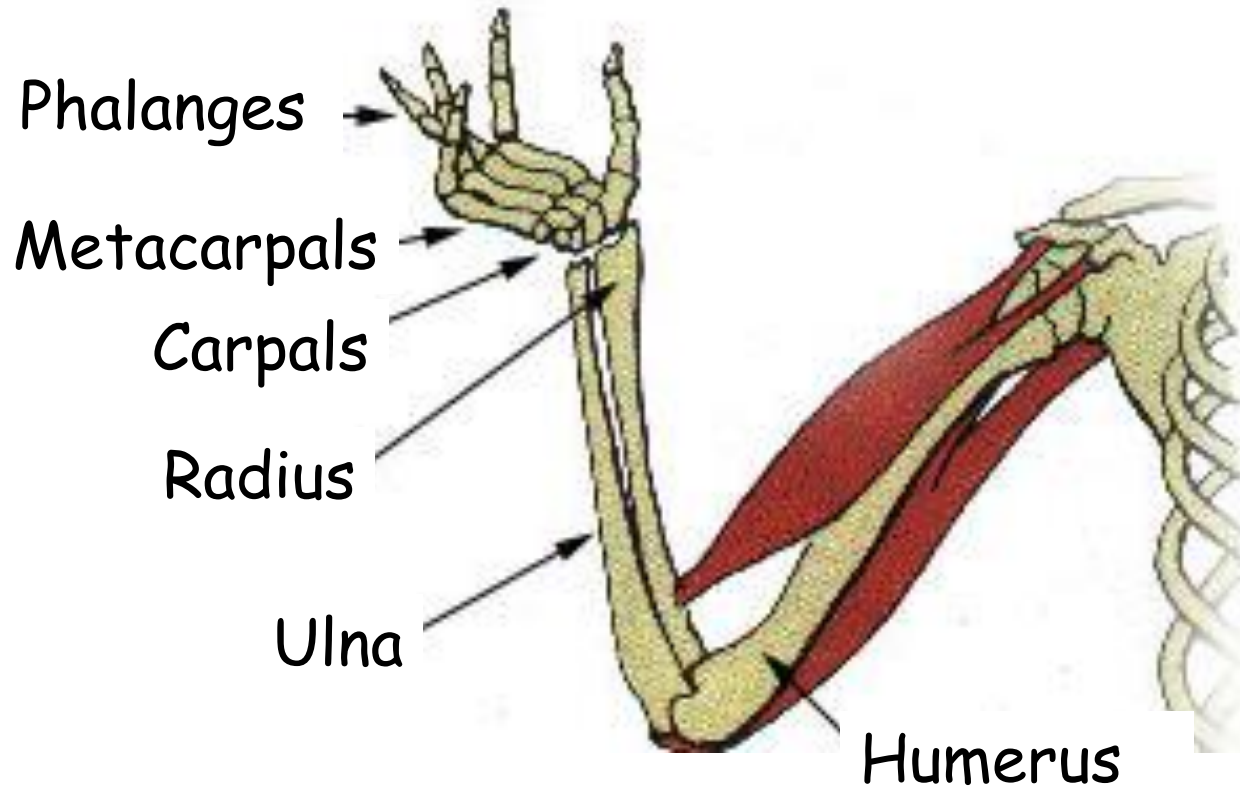
Human Arm



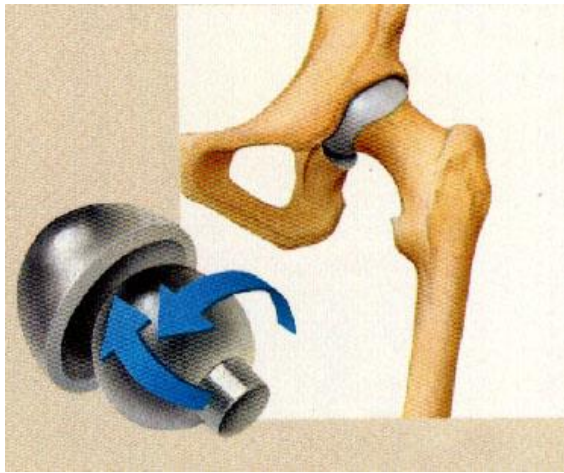
Connective Tissue: Skeleton



Human Arm

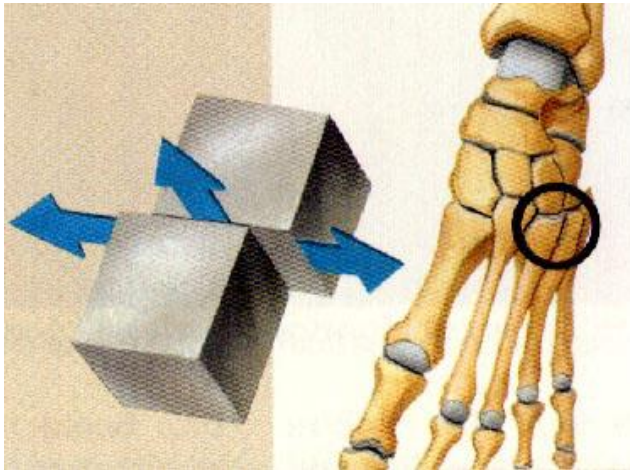


Joints



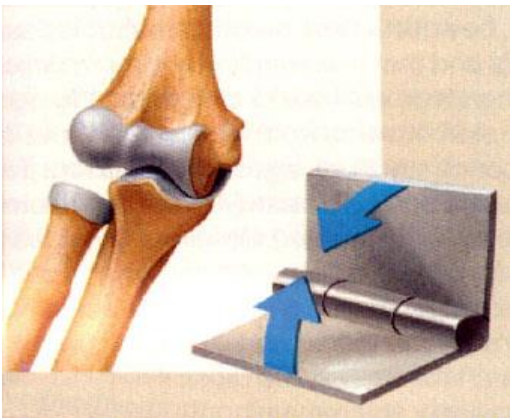
Ball & Socket

Shoulder, hip; greatest movement



Gliding

Wrist; foot; bones slide over each other.

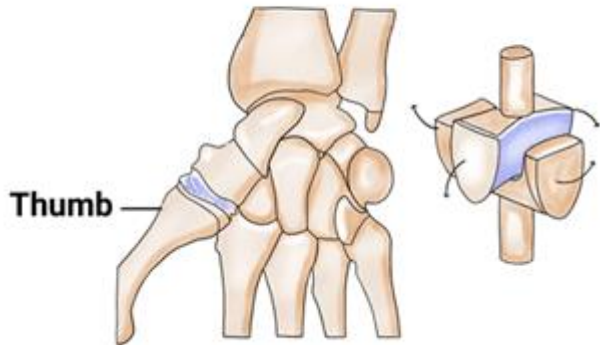


Hinge

Elbow, knee; one plane

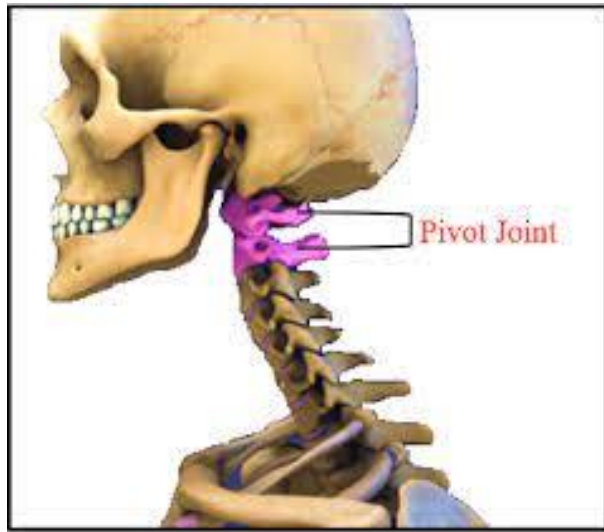
Joints

Saddle joint



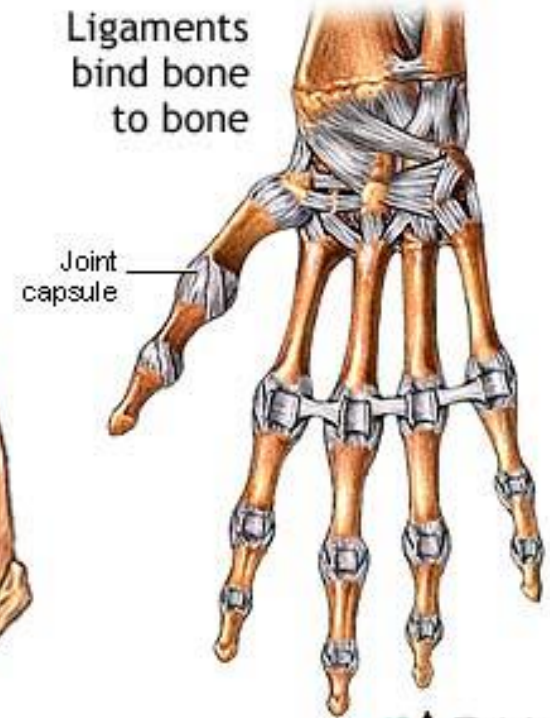
Saddle

Thumb; middle ear; sterno-clavicle joint of thorax; heel; stability; flexibility



Pivot

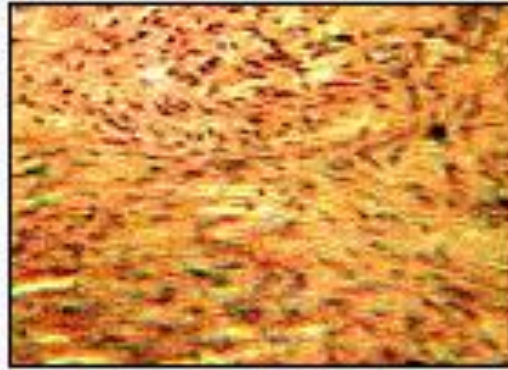
Vertebrae; rotary movement



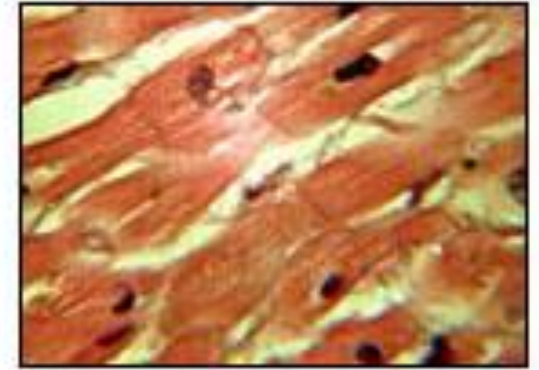
Muscle Tissue



Skeletal muscle



Smooth muscle



Cardiac muscle

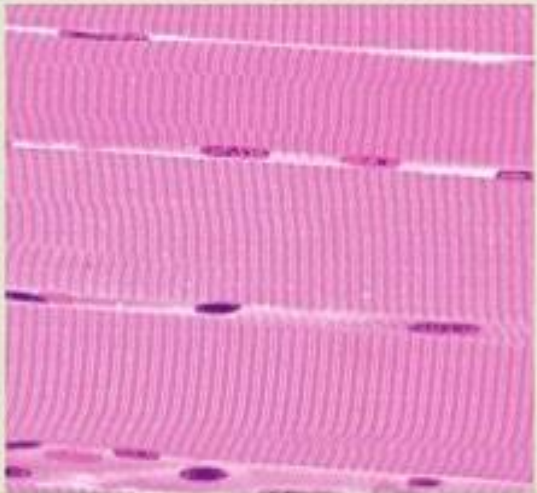
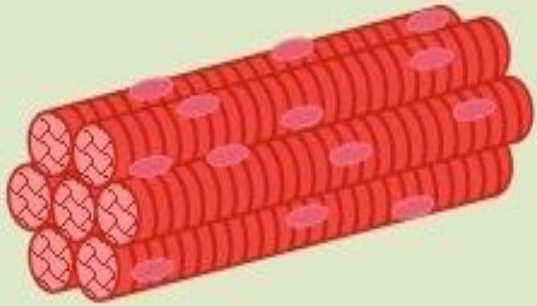
The muscular system is responsible for the movement of the human body. There are three (3) main types of muscle tissue.

Attached to the bones of the skeletal system are about 700 named muscles that make up roughly half of a person's body weight. Each of these muscles is a discrete organ constructed of skeletal muscle tissue, blood vessels, tendons, and nerves.

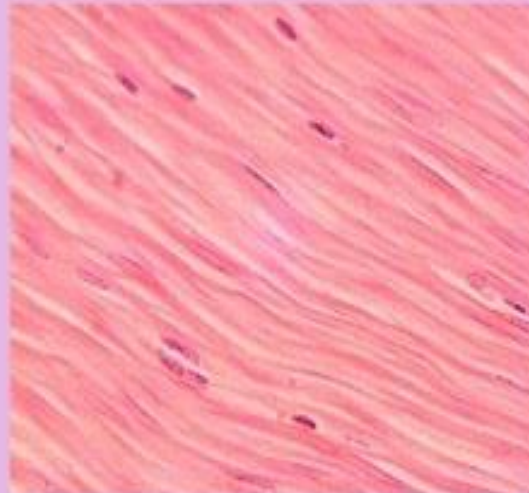
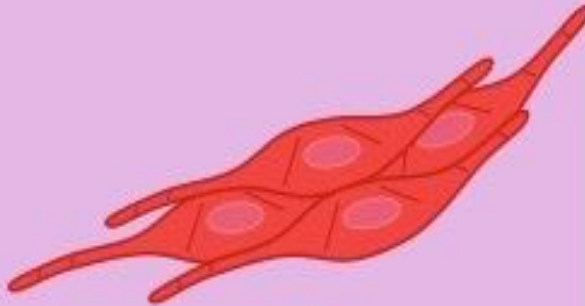
Muscle tissue is also found inside of the heart, digestive organs, and blood vessels. In these organs, muscles serve to move substances throughout the body.

Muscle Tissue

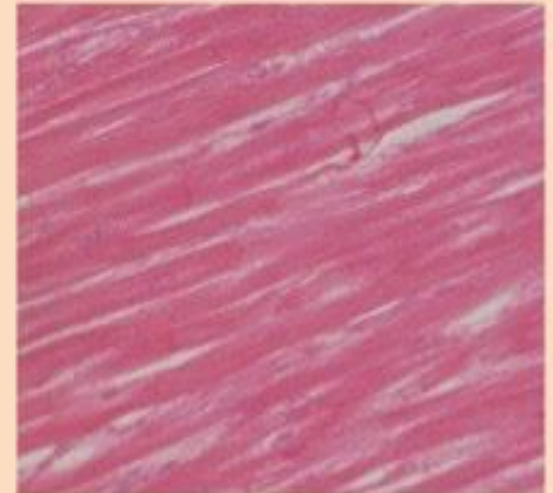
Skeletal Muscle



Smooth Muscle



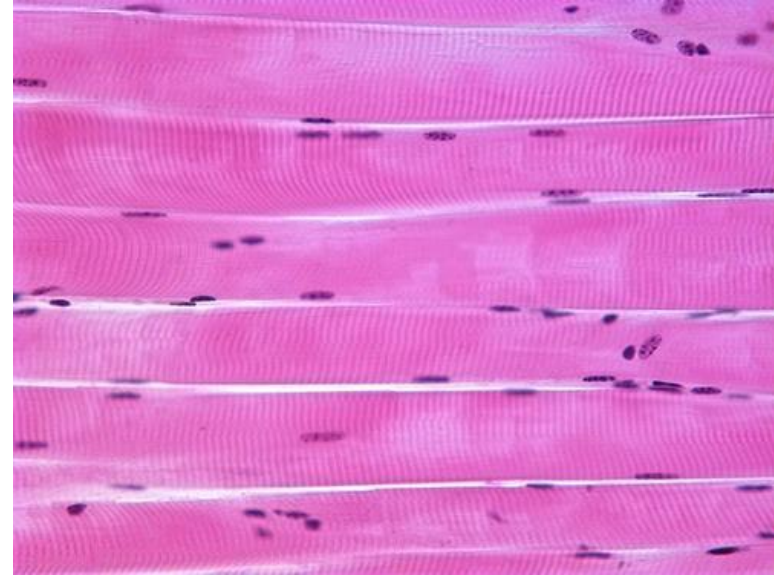
Cardiac Muscle



Skeletal Muscle

Skeletal muscle is the only **VOLUNTARY** muscle tissue in the human body — it is controlled consciously.

Every physical action that a person consciously performs (e.g. speaking, walking, or writing) requires skeletal muscle.



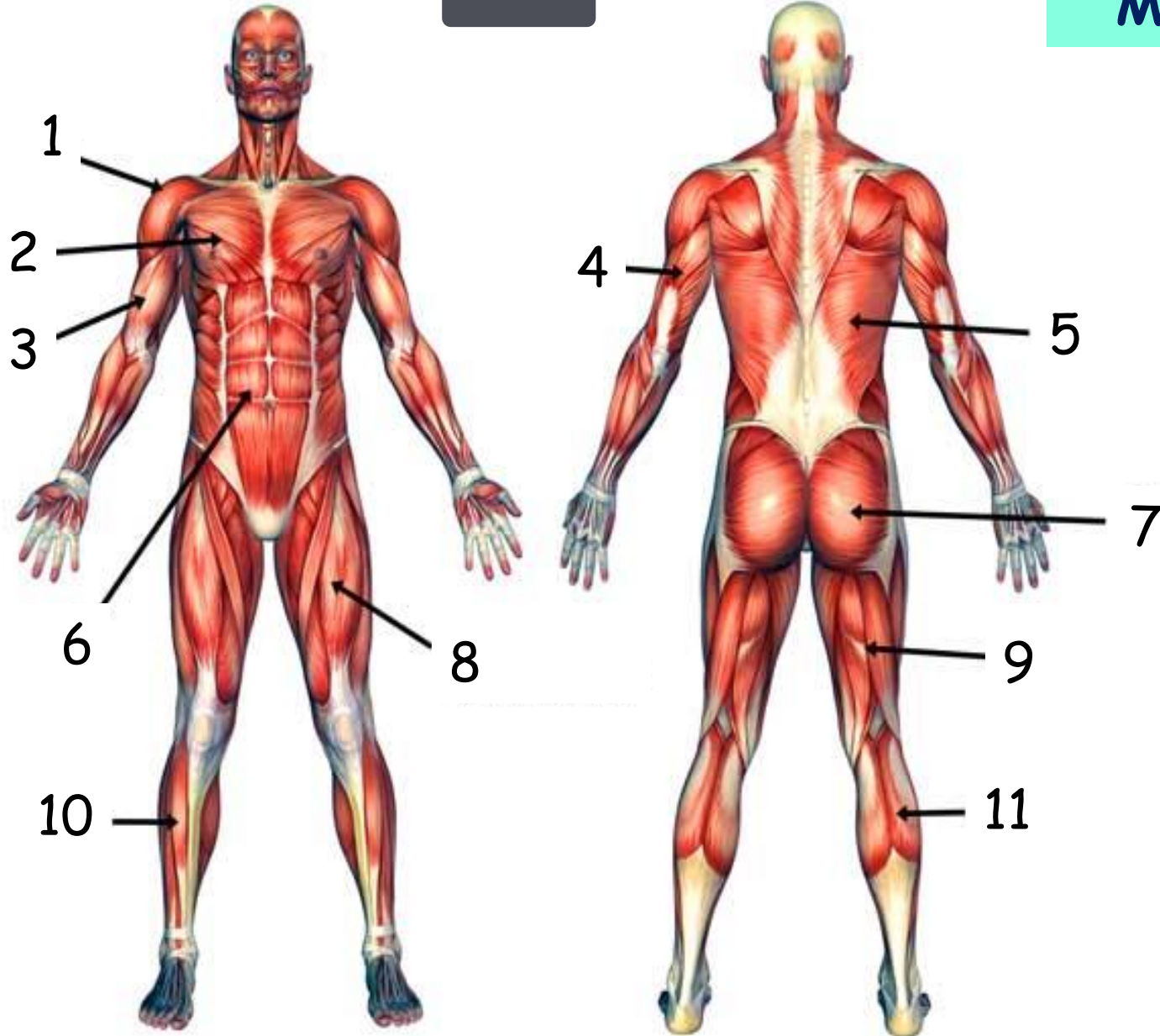
Skeletal muscle is anchored by tendons to bone and is used to affect skeletal movement such as locomotion and in maintaining posture.

Most skeletal muscles are attached to two bones across a joint.

An average adult male is made up of 40–50% of skeletal muscle and an average adult female is made up of 30–40%.

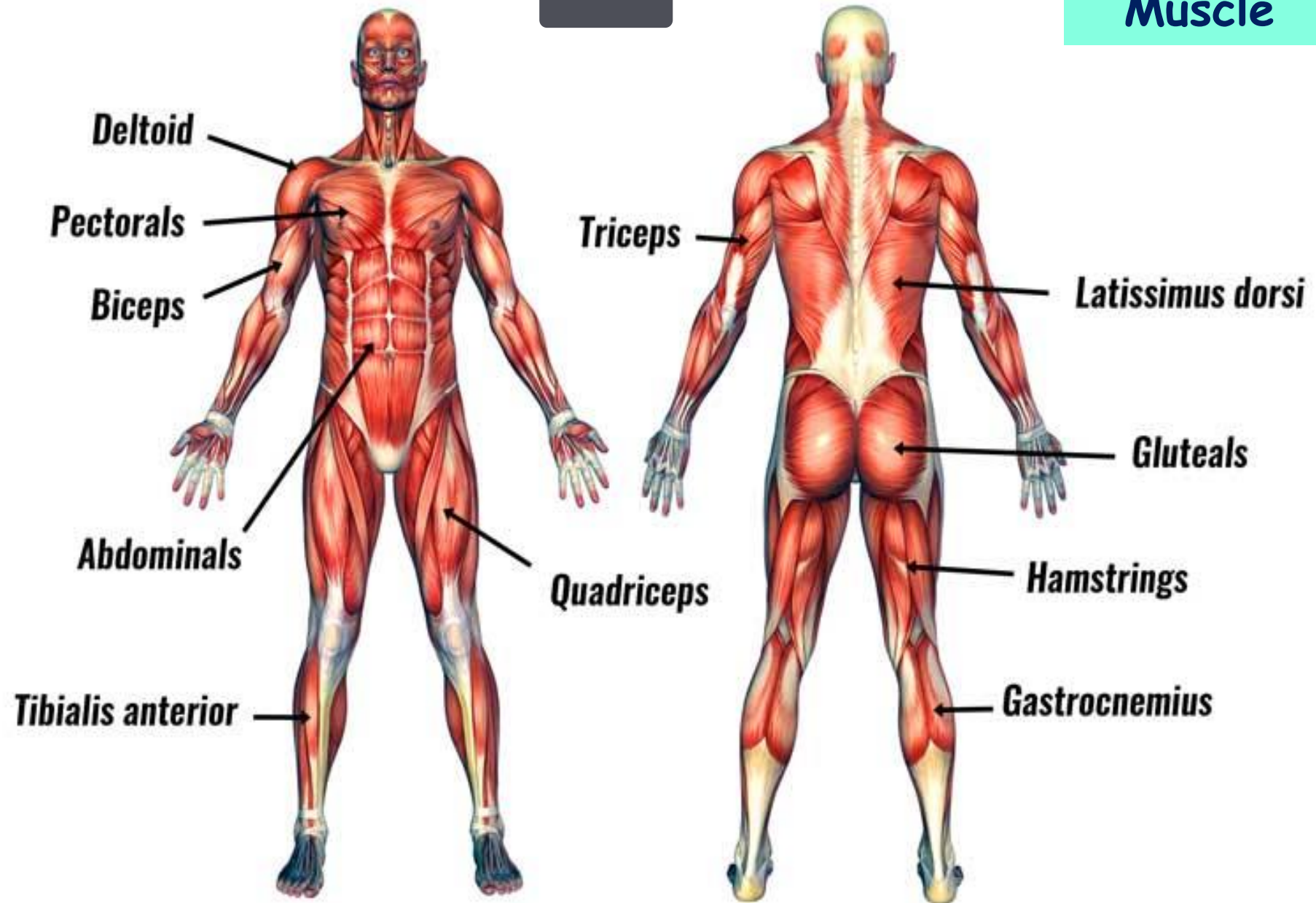
TRY IT

Skeletal Muscle



TRY IT

Skeletal Muscle



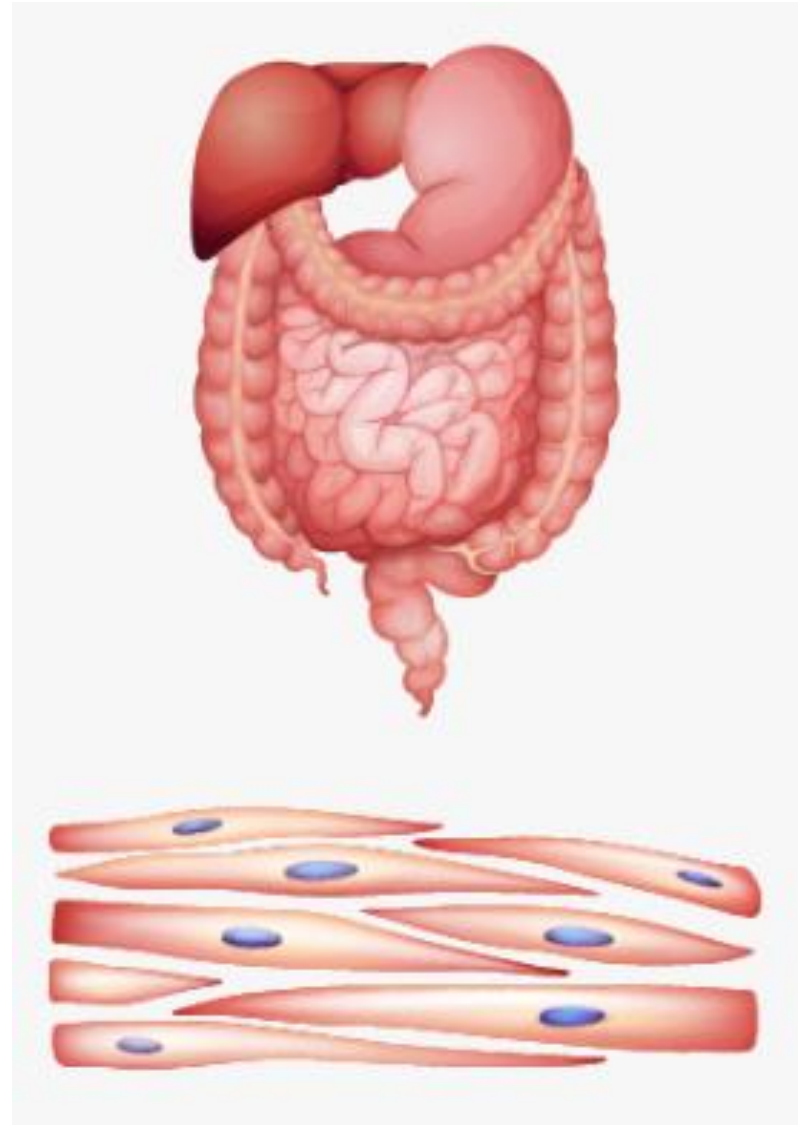
Visceral “Smooth” Muscle

Visceral muscle is found inside of organs like the esophagus, stomach, intestines, bronchi, urethra, & blood vessels.

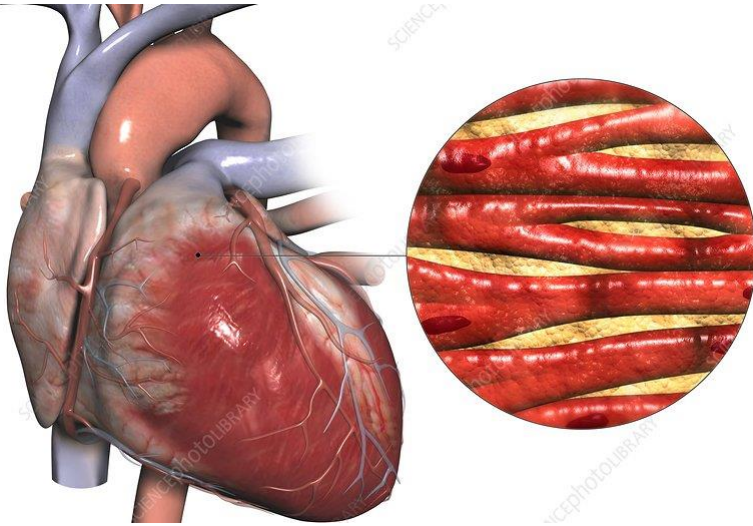
The weakest of all muscle tissues, visceral muscle makes organs contract to move substances through the organ.

Because visceral muscle is controlled by the unconscious part of the brain, it is known as **INVOLUNTARY** muscle—it cannot be directly controlled by the conscious mind.

The term “smooth muscle” is often used to describe visceral muscle because it has a very smooth, uniform appearance when viewed under a microscope.



Cardiac Muscle



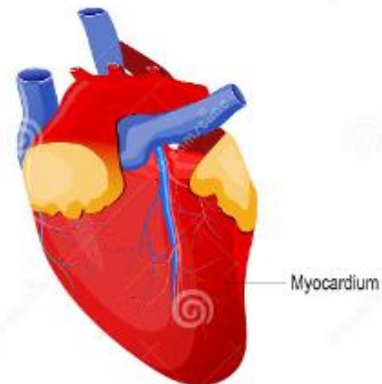
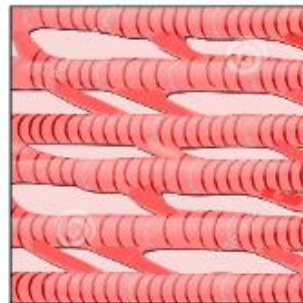
Found only in the heart, cardiac muscle is responsible for pumping blood throughout the body.

Cardiac muscle tissue cannot be controlled consciously, so it is an involuntary muscle.



The cells of cardiac muscle tissue are striated — that is, they appear to have light and dark stripes when viewed under a light microscope.

Cardiac tissue

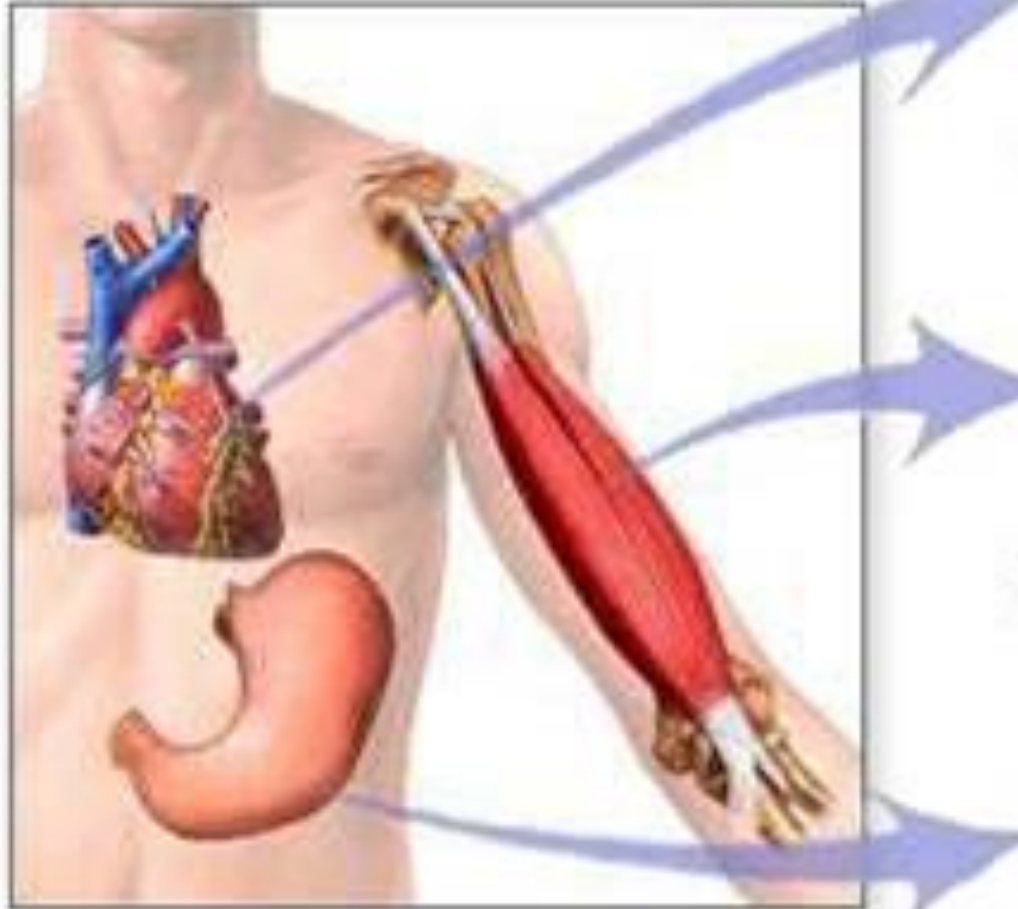


Striations indicate that a muscle cell is very strong, unlike visceral muscles.

Muscle Tissue

TRY IT

Give the type & location.



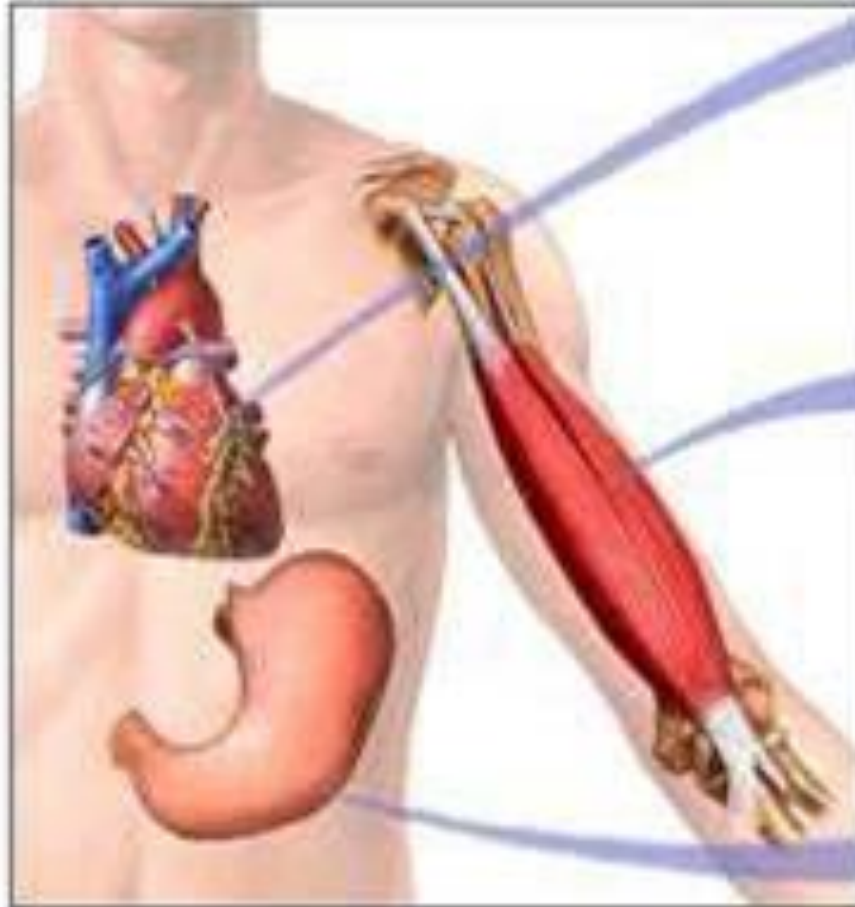
1

2

3

Muscle Tissue

TRY IT



Cardiac muscle cell
Only in the Heart



Skeletal muscle cell
Voluntary Movements



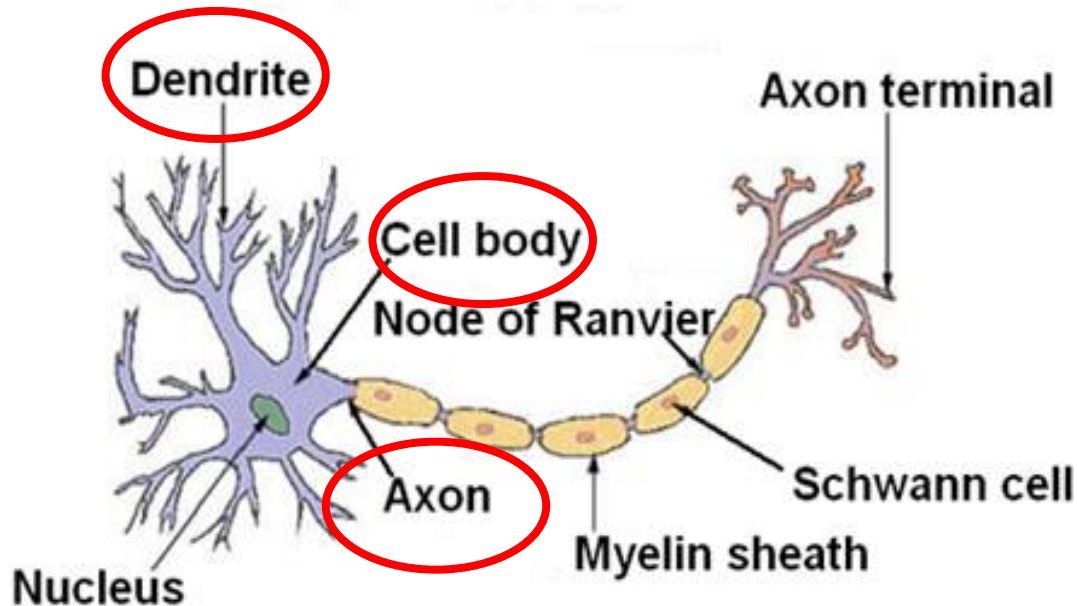
Smooth muscle cell
*Involuntary Movements
(Ex. Digestion)*

Nervous Tissue

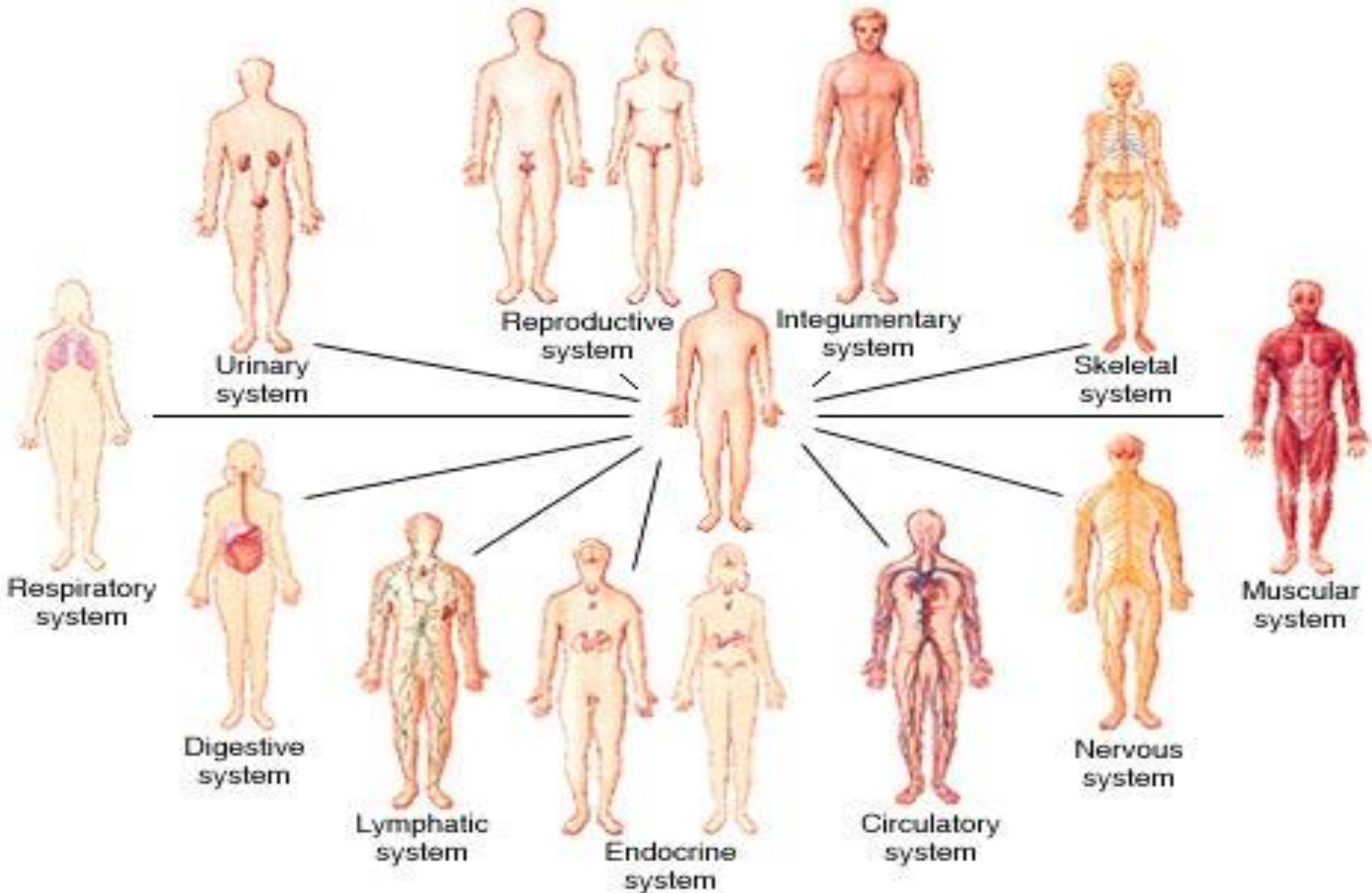
Communication with other tissues through electrical signals (**Action Potentials**).

Neuron: Basic Unit of Nervous System.

Structure of a Typical Neuron



Organ Systems



Organ Systems

work together to perform life's functions

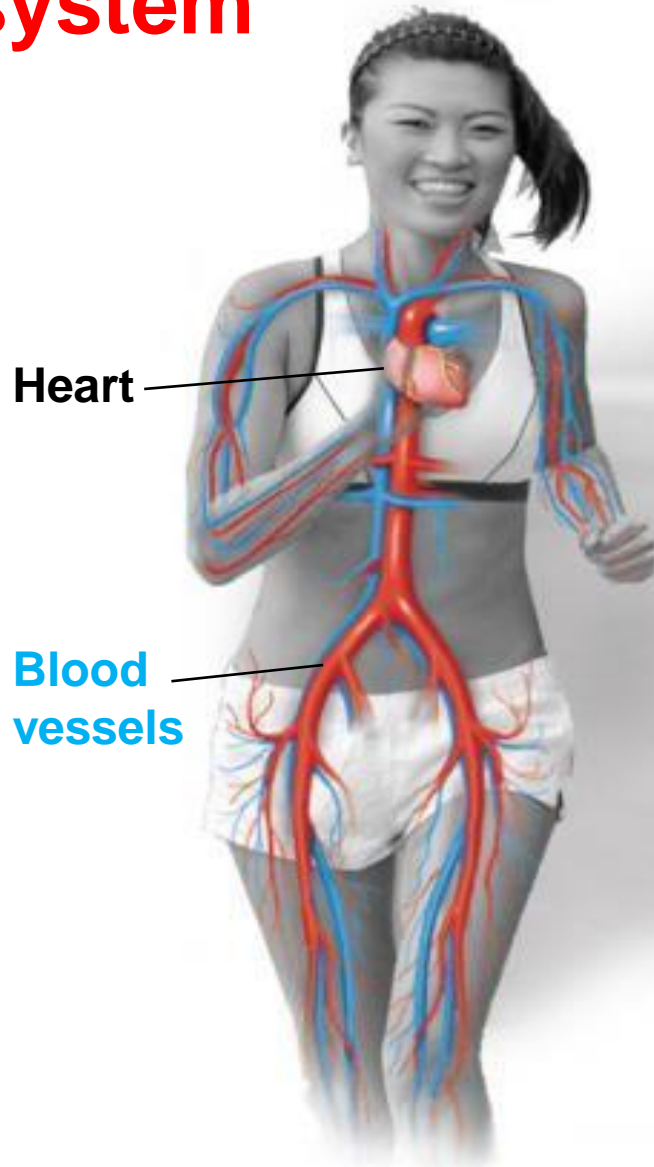
The **Circulatory System**

- delivers oxygen and nutrients to body cells.
- transports carbon dioxide to the lungs.
- carries metabolic wastes to the kidneys.

The **Respiratory System**

- exchanges gases with the environment.
- supplying the blood with oxygen.
- disposing of carbon dioxide.

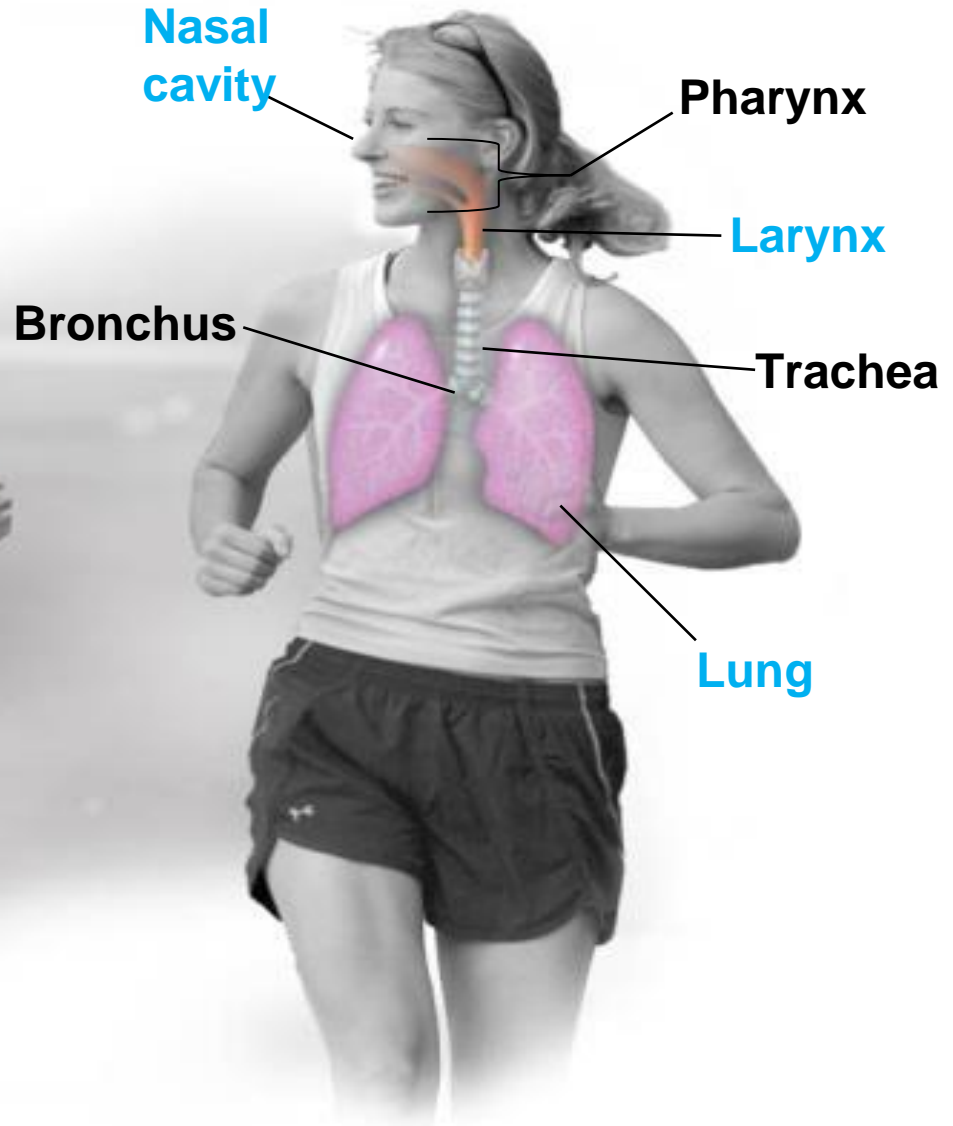
Circulatory system



Heart

Blood vessels

Respiratory system



Nasal cavity

Pharynx

Larynx

Bronchus

Trachea

Lung

Organ Systems
work together to perform life's functions

The **Integumentary System**

(outer layer of skin, nails, hair) which acts as a physical barrier, protecting against

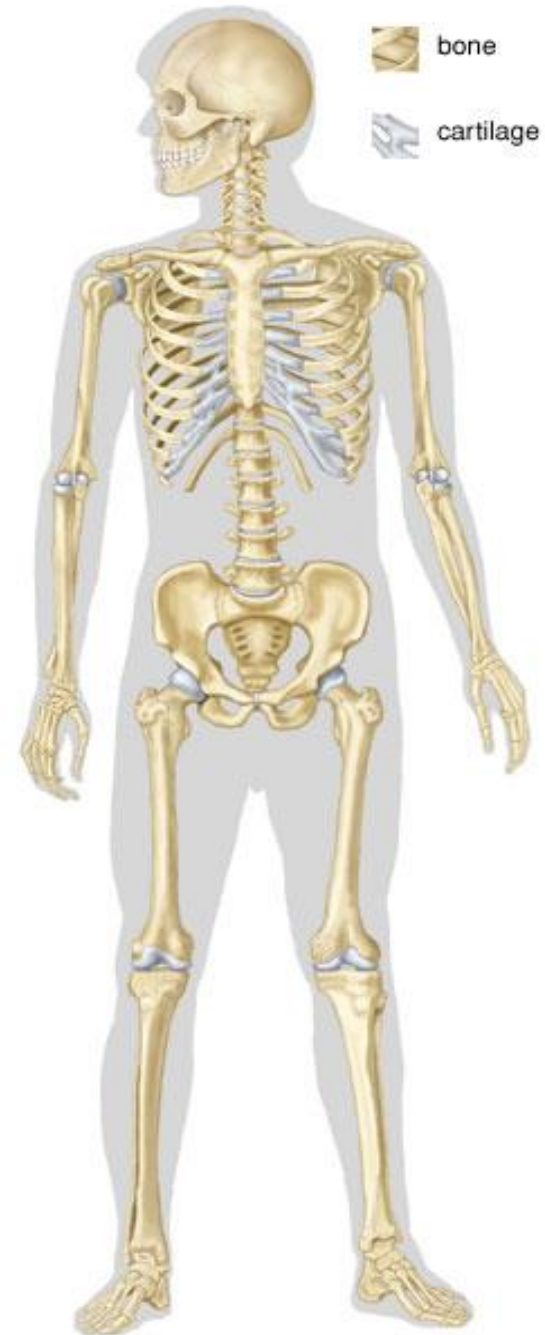
- physical injury.
- Infection (bacteria, fungus).
- excessive heat or cold.
- drying out.



Organ Systems
work together to perform life's functions

The **Skeletal System**

- supports the body.
- protects organs such as the brain and lungs.
- provides the framework for muscle movement.



Organ Systems
work together to perform life's functions

The Muscular System

- moves the body.
- maintains posture.
- produces heat.



Organ Systems
work together to perform life's functions

The Urinary System

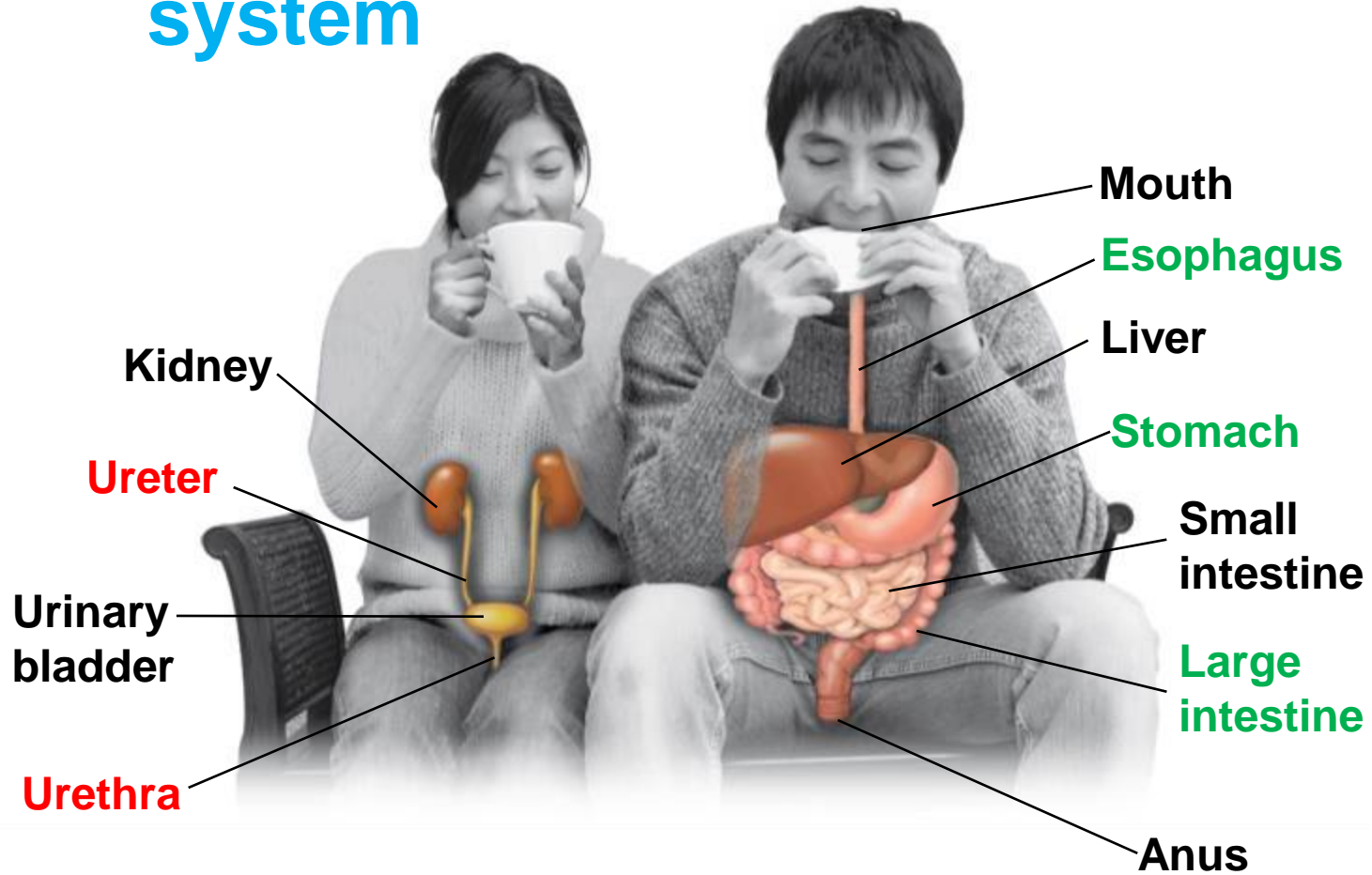
- removes waste products from the blood.
- excretes urine.
- regulates the chemical makeup, pH, and water balance of blood.

The Digestive System

- ingests and breaks down food.
- absorbs nutrients.
- eliminates undigested material.

Urinary system

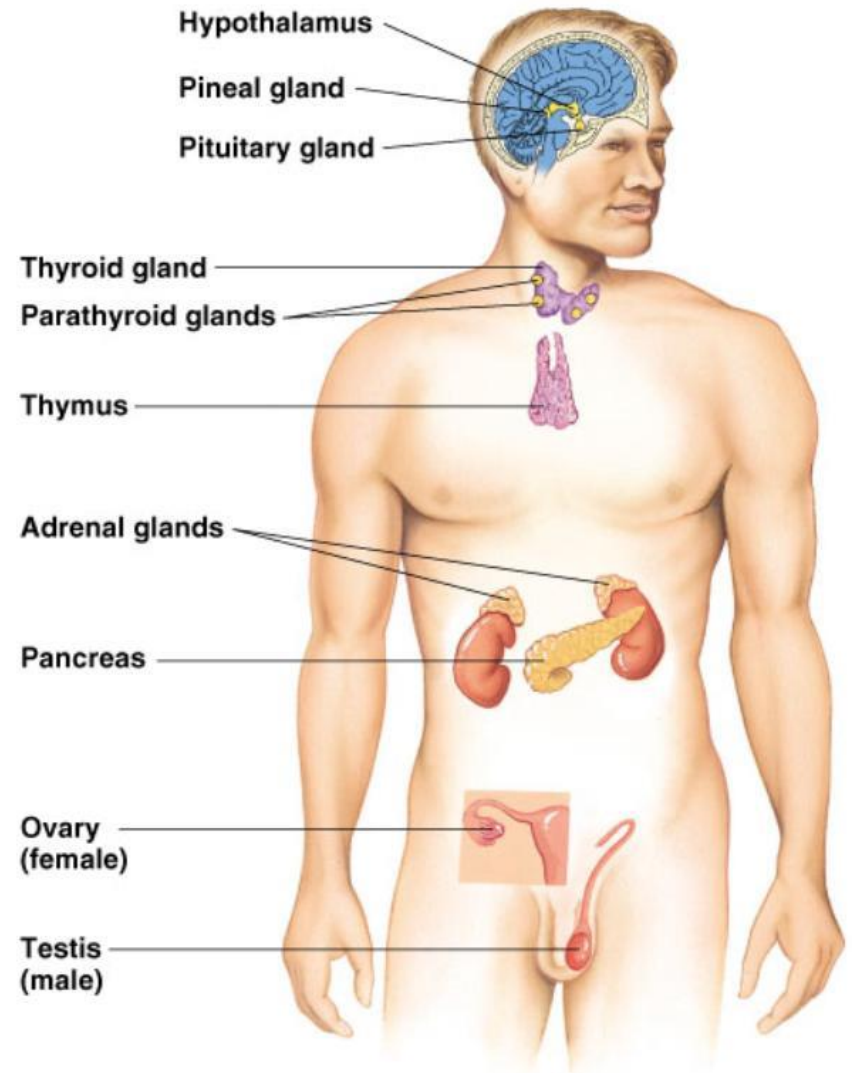
Digestive system



Organ Systems
work together to perform life's functions

The Endocrine System

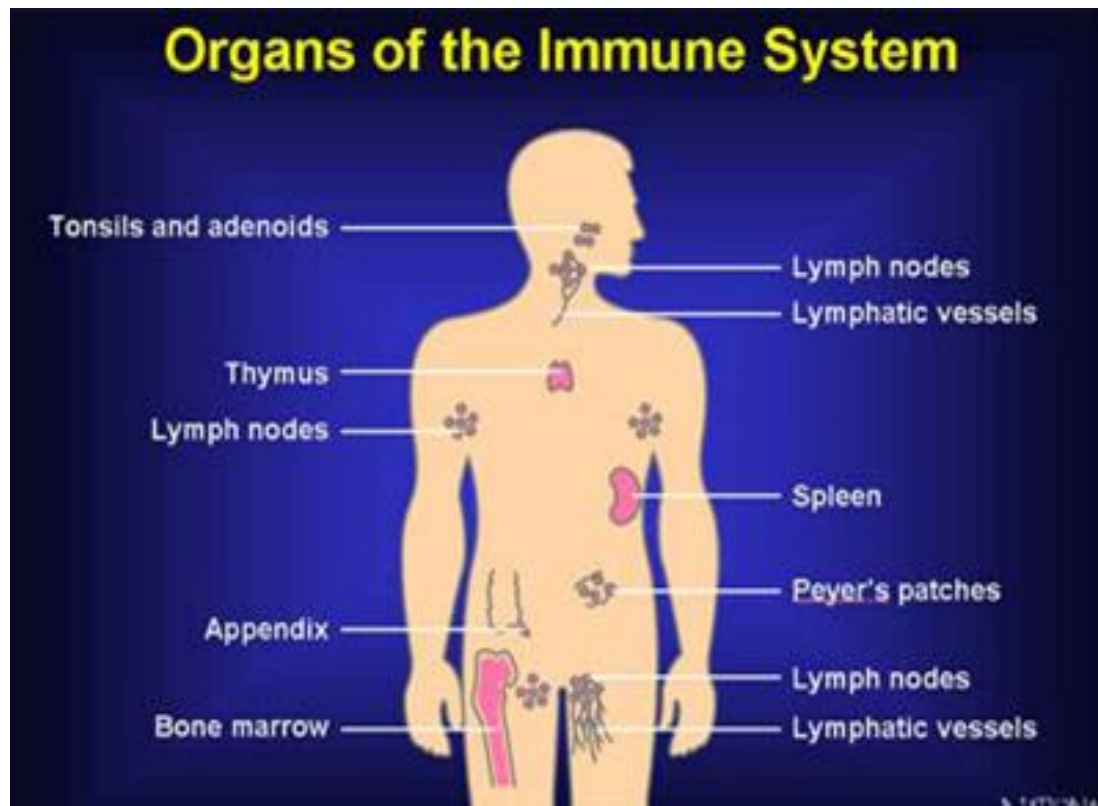
secretes hormones that regulate body activities.



Organ Systems
work together to perform life's functions

The **Lymphatic** and **Immune Systems** protect the body from infection and cancer.

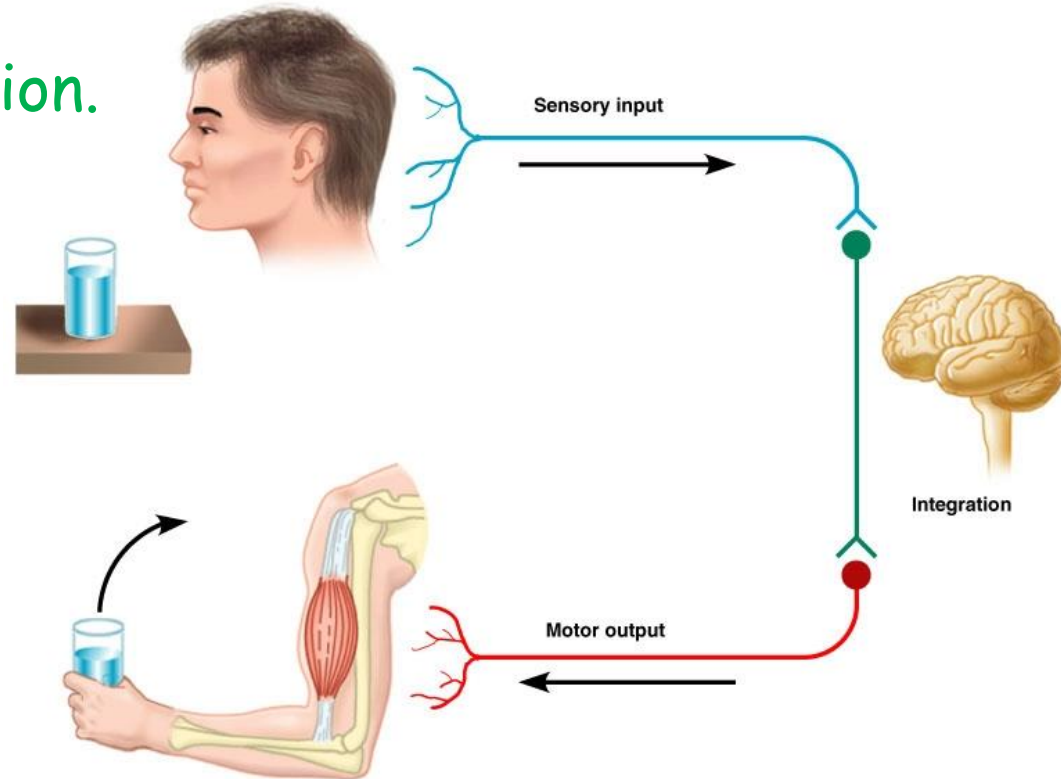
The lymphatic system also returns excess body fluid to the circulatory system.



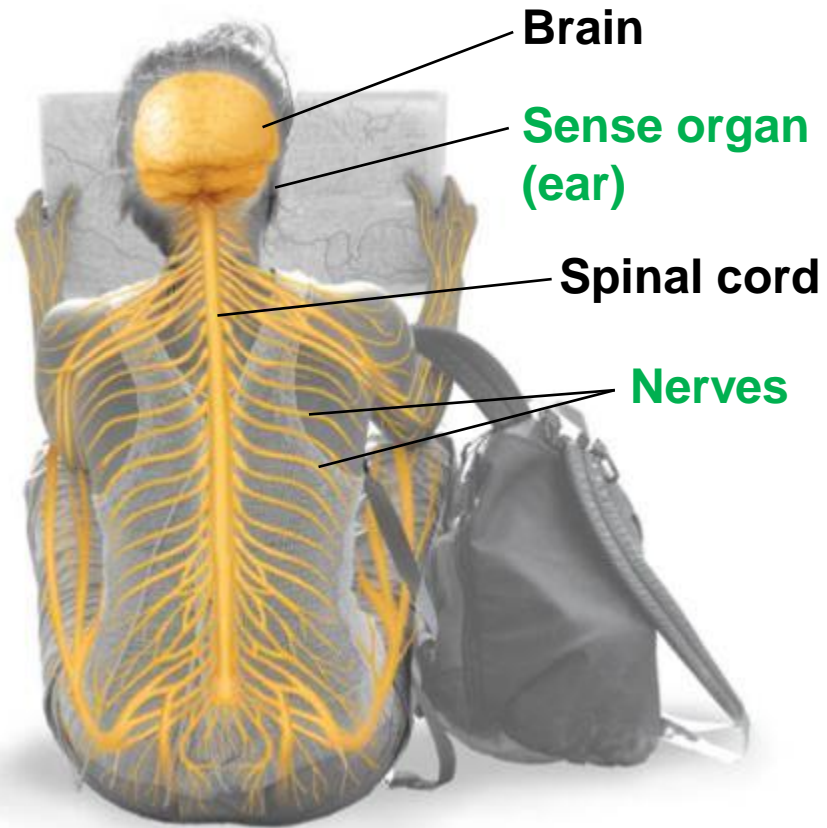
Organ Systems
work together to perform life's functions

The **Nervous System** coordinates body activities by

- detecting stimuli.
- integrating information.
- directing responses.



Nervous system



Organ Systems work together to perform life's functions

The **Reproductive System** produces

- gametes (eggs and sperm cells).
- sex hormones.

The **Female Reproductive System**

- supports a developing embryo.
- produces milk.

Reproductive system

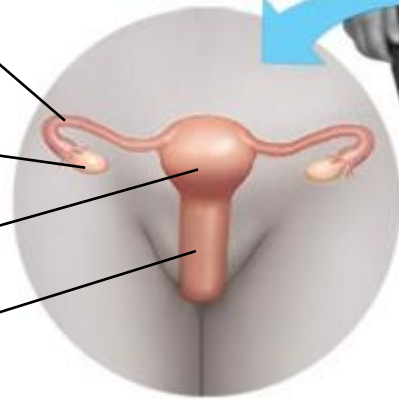
Female

Oviduct

Ovary

Uterus

Vagina



Male

Seminal vesicles

Prostate gland

Vas deferens

Penis

Urethra

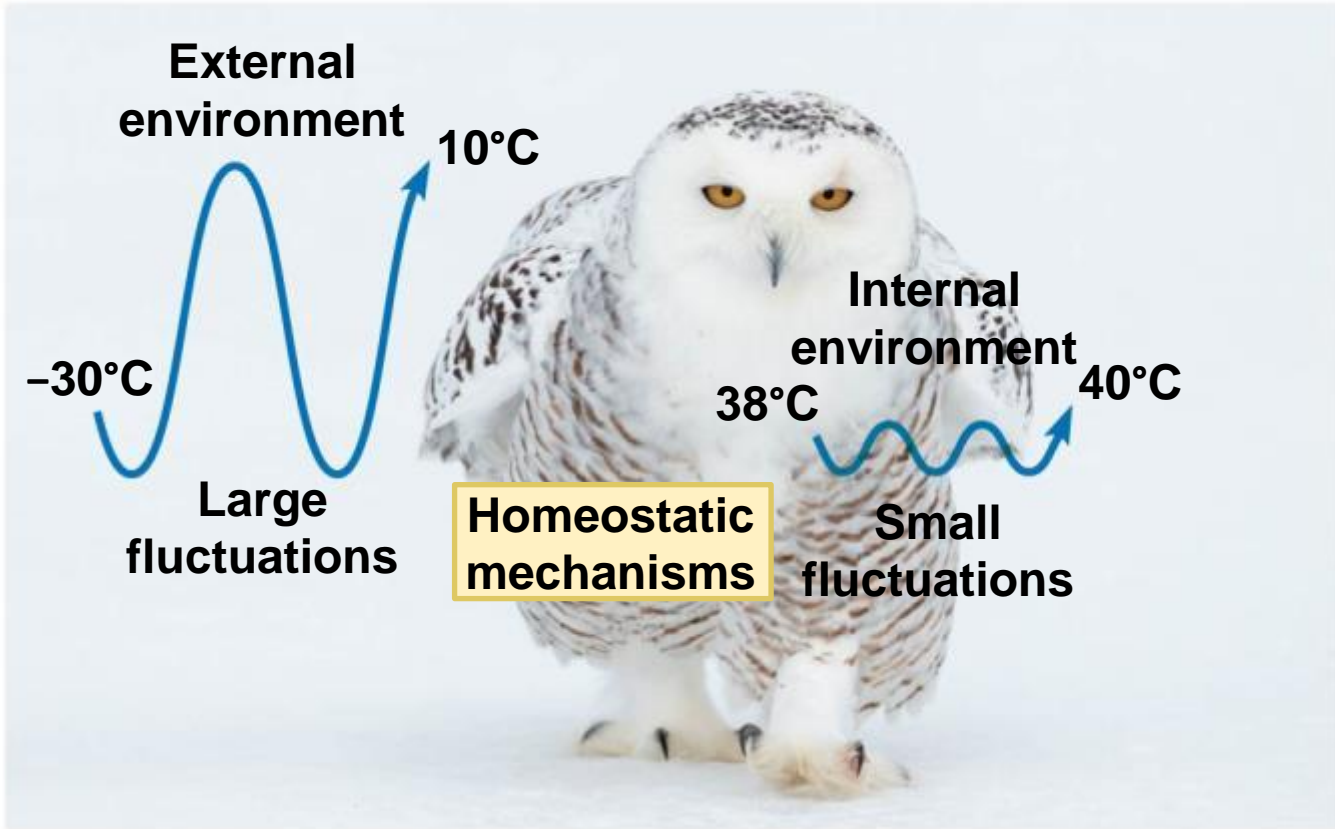
Testis



Regulating Internal Environment

HOMEOSTASIS

- is the active maintenance of a steady state within the body especially related to temperature, pH, and physiological functions.
- External environmental conditions may fluctuate wildly.
- Homeostatic mechanisms regulate internal conditions.

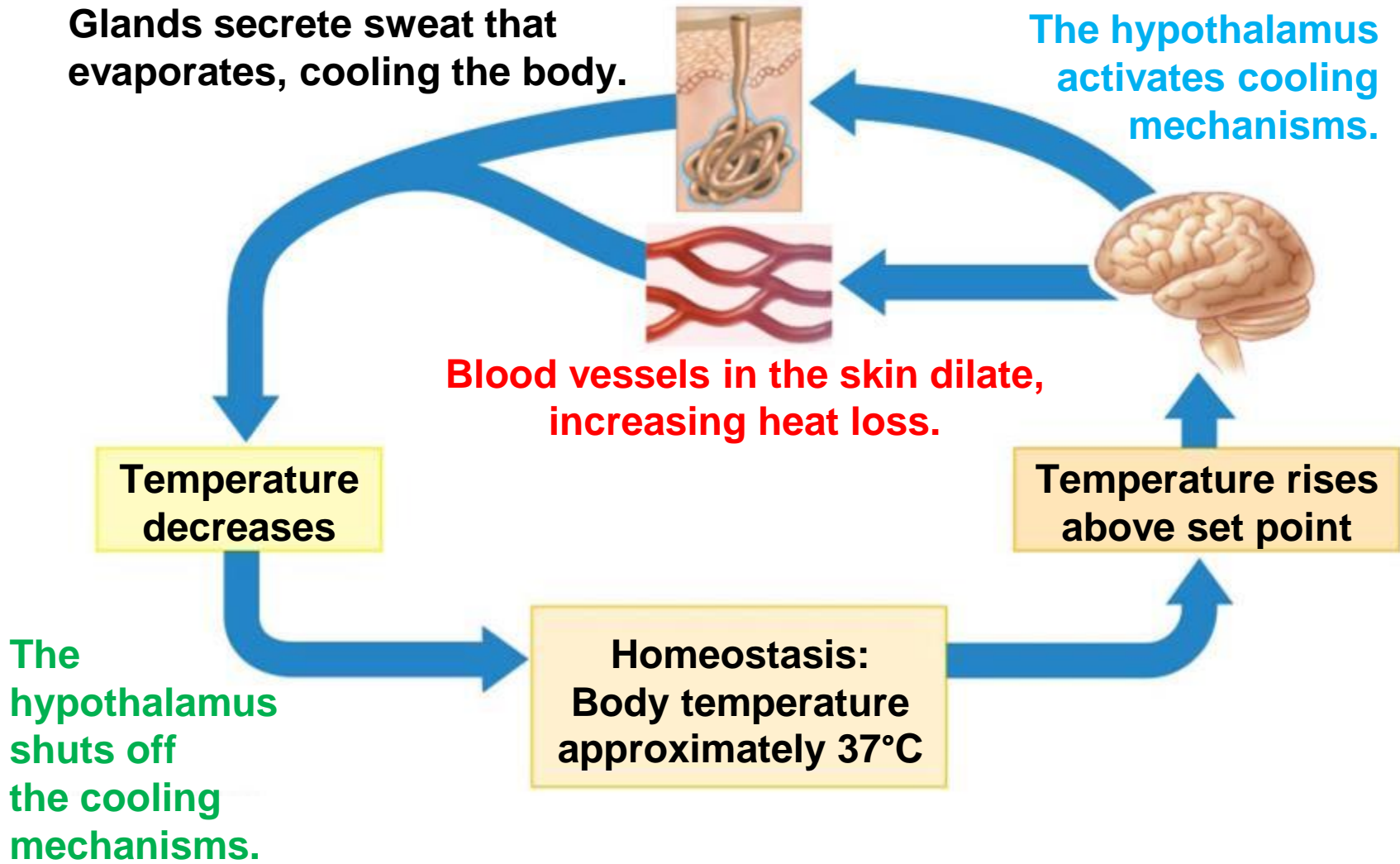


Homeostasis depends on Negative Feedback

- Control systems
 - detect change.
 - directs responses.

Negative-Feedback mechanisms

- keep internal variables steady.
- permit only small fluctuations around set points.



The hypothalamus shuts off the warming mechanisms.

Homeostasis:
Body temperature approximately 37°C

Temperature falls below set point



Blood vessels in the skin constrict, minimizing heat loss.



Temperature increases



Skeletal muscles contract; shivering generates heat.

The hypothalamus activates warming mechanisms.

