

ANATOMY & PHYSIOLOGY FOR CODING PROFESSIONALS



BAKER|NEWMAN|NOYES

BOSTON • MANCHESTER • PORTLAND • PORTSMOUTH

FOR PRESENTATION PURPOSES ONLY

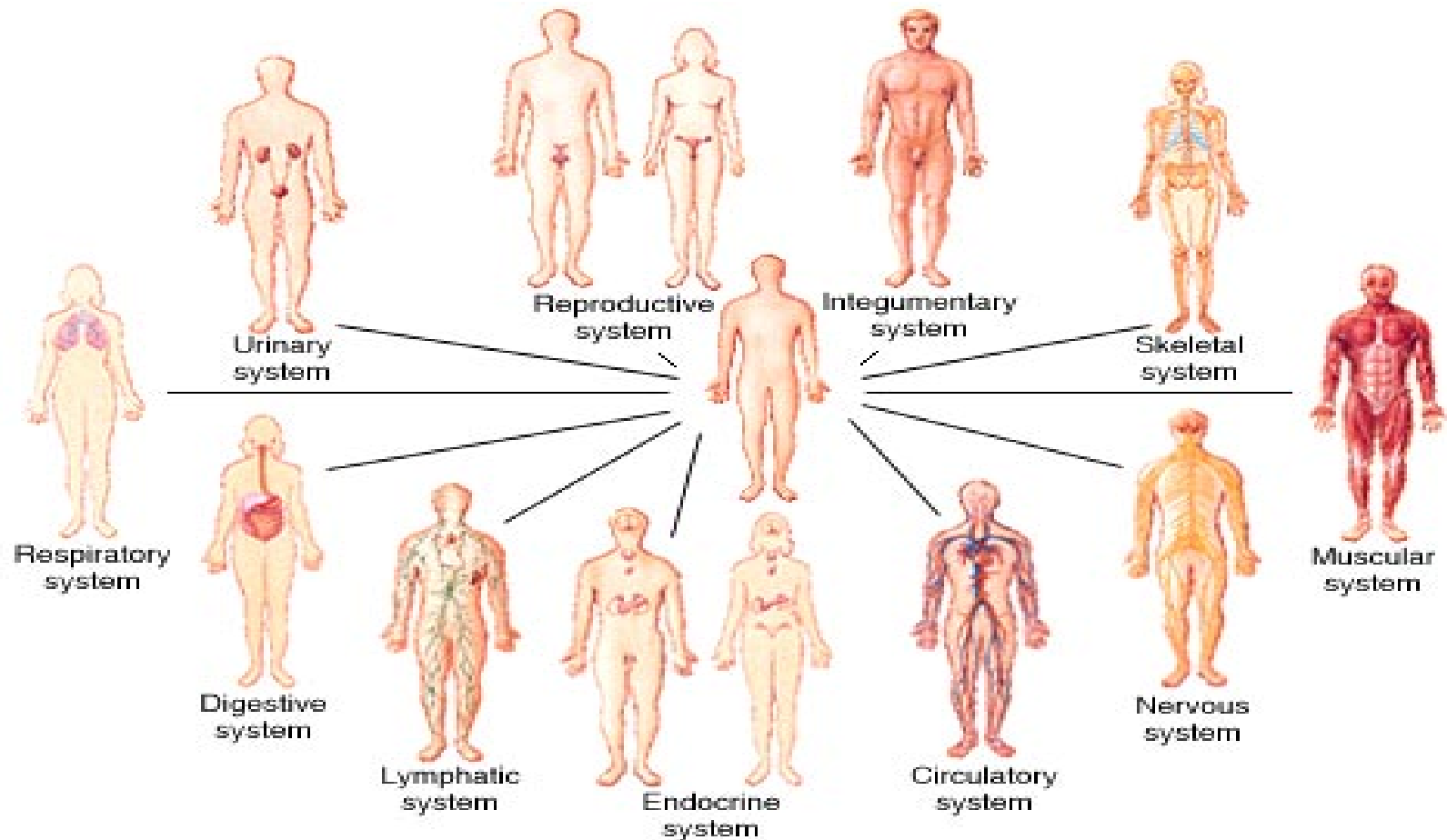
COURSE OBJECTIVES

- Basic review of structure and function of various organs in the major body systems
- Highlight common disease states and conditions associated with these body systems
- Identify opportunities to apply knowledge in coding scenarios

BODY SYSTEMS

- Hematopoietic & Immune
- Endocrine
- Nervous
- Circulatory
- Respiratory
- Digestive
- Integumentary
- Musculoskeletal
- Genitourinary

BODY SYSTEMS



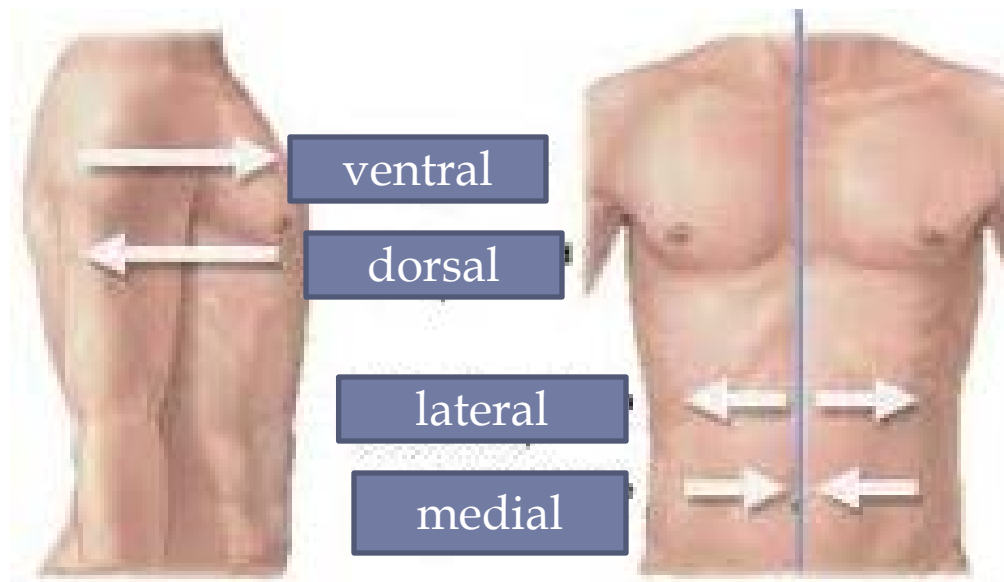
INTRODUCTION

- **Anatomy**- the science of the *structure* of living organisms
- **Physiology**-study of the normal *functions* of living organisms
- Working knowledge of the body structures is necessary in order to understand their functions

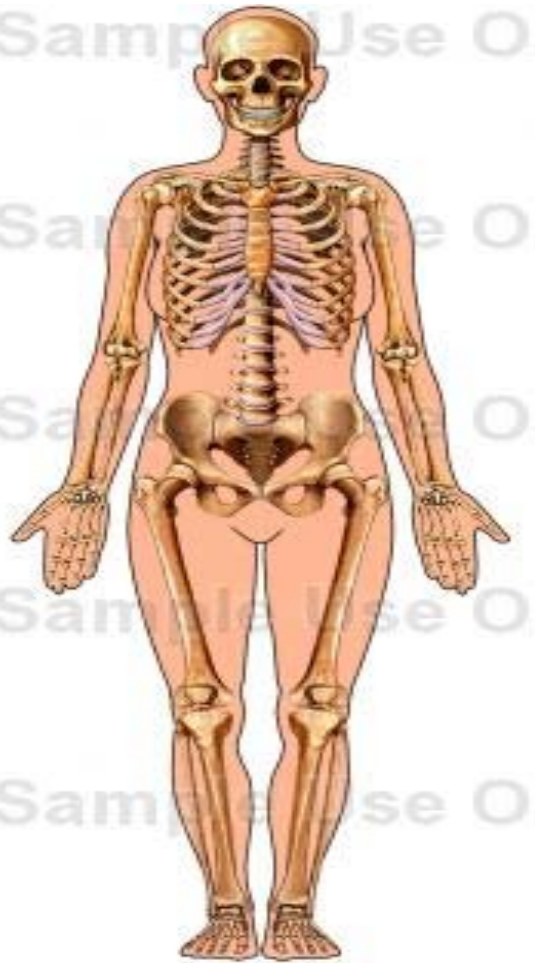
ANATOMIC TERMS

- Directional
 - Anterior (ventral)-toward the front
 - Posterior (dorsal)-toward the back of the body
 - Inferior (caudal)-away from the head
 - Superior (cephalad)-toward the head
 - Medial-toward the mid-line
 - Lateral-away from the mid-line
 - Superficial-nearer to the skin surface

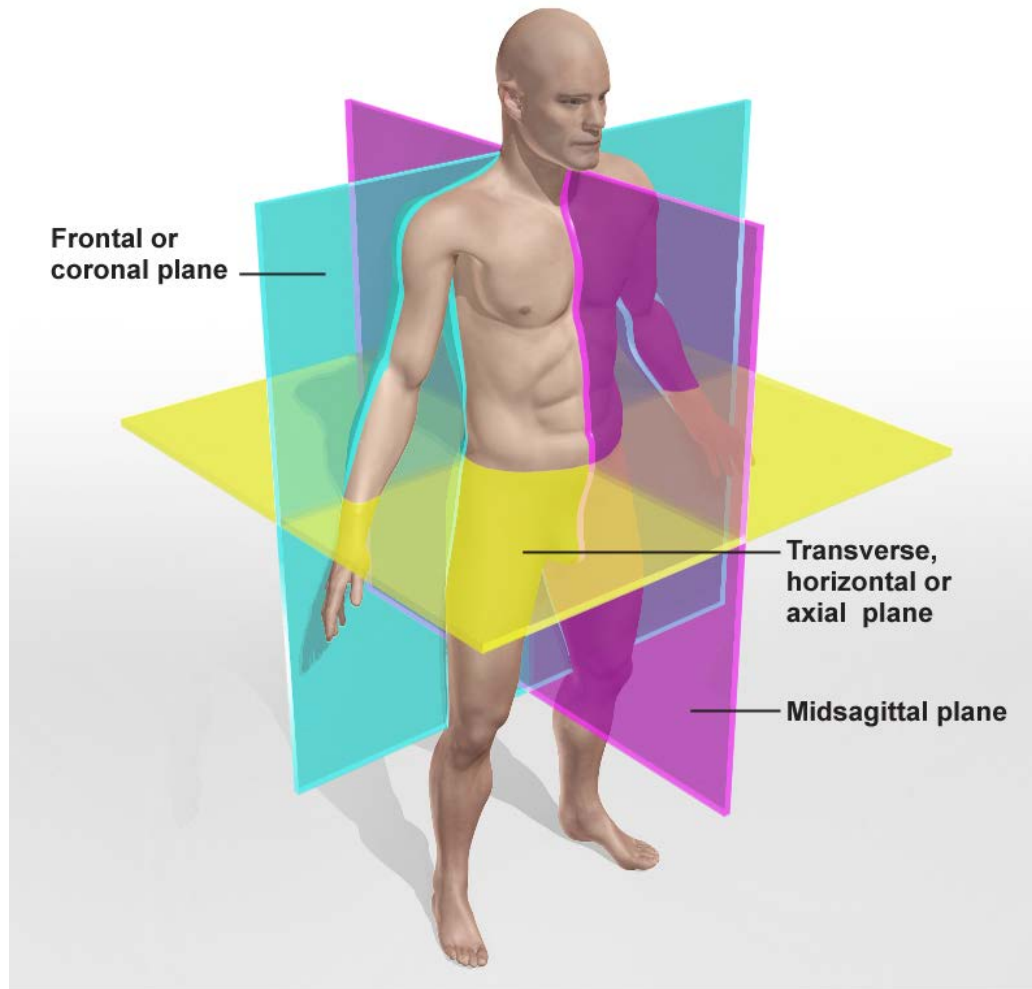
DIRECTIONAL



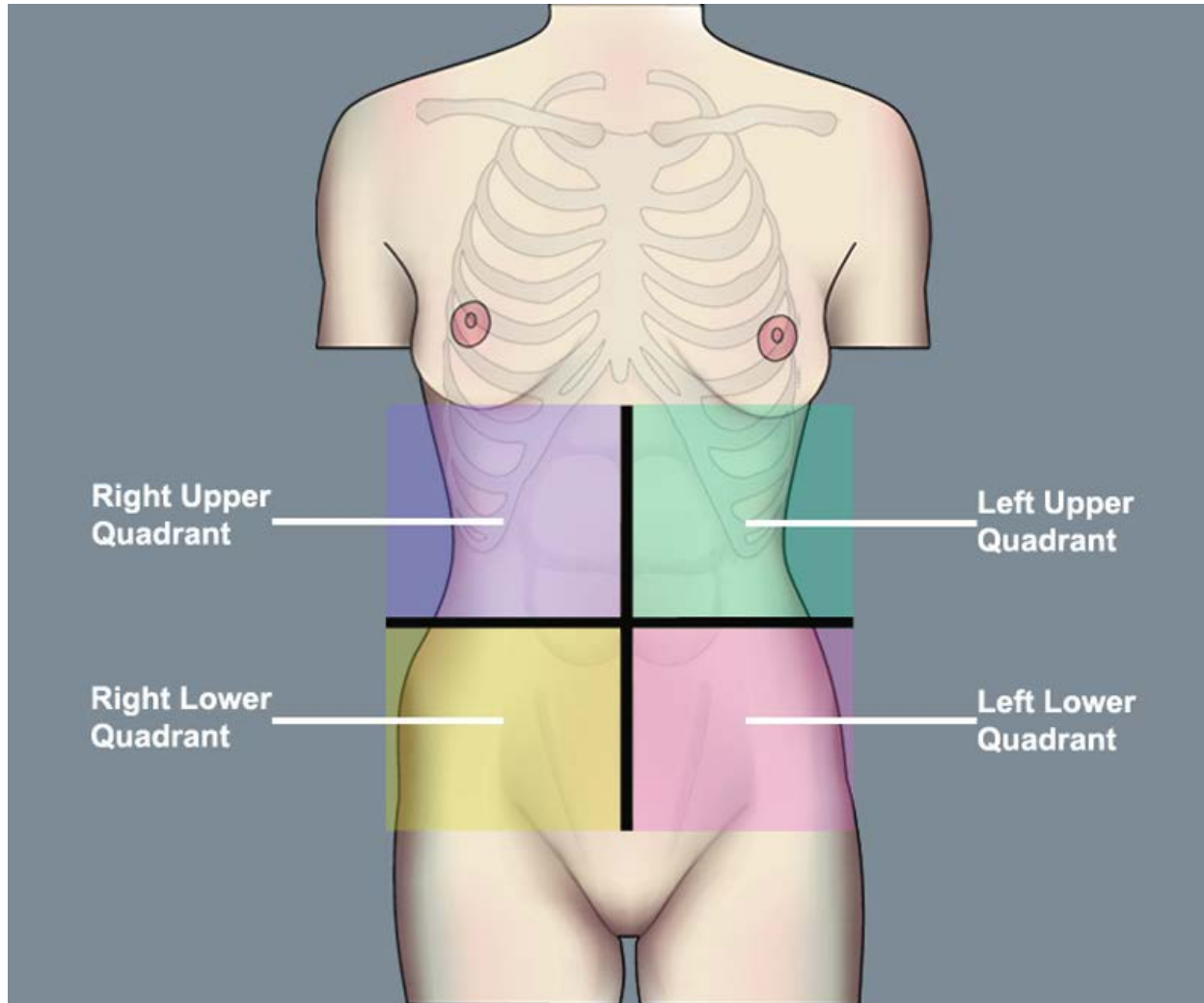
ANATOMICAL POSITION



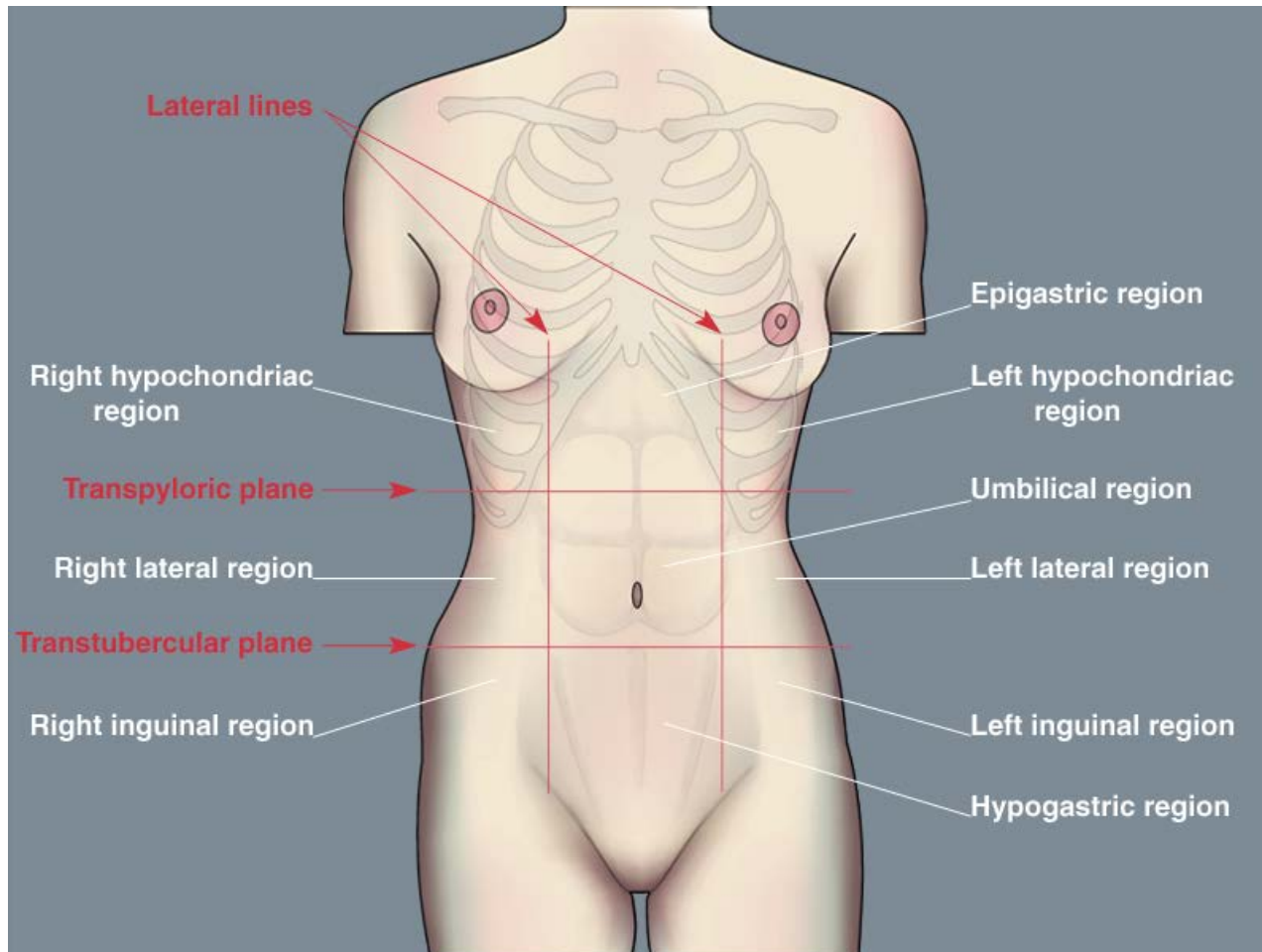
PLANES



QUADRANTS

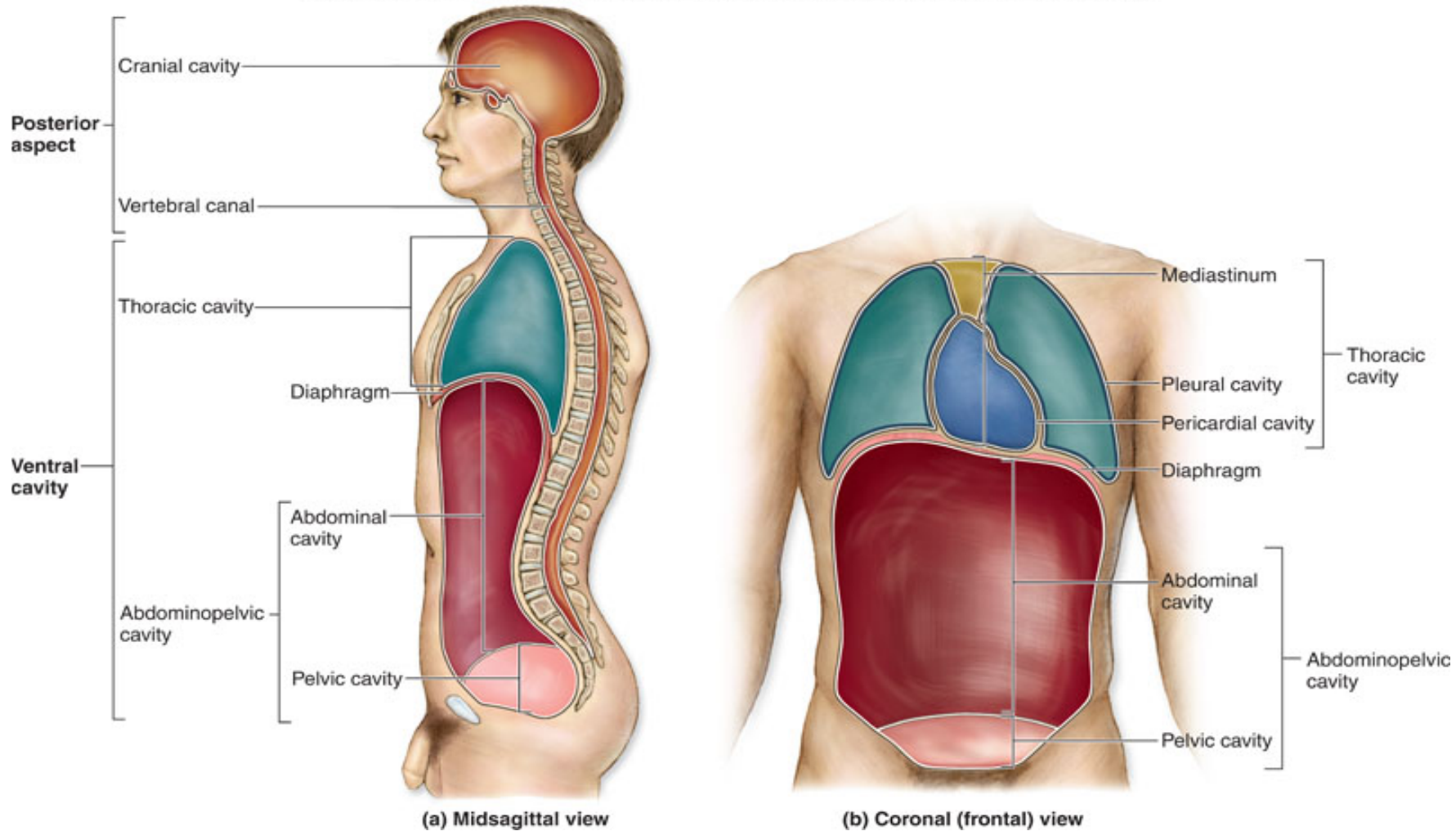


REGIONS

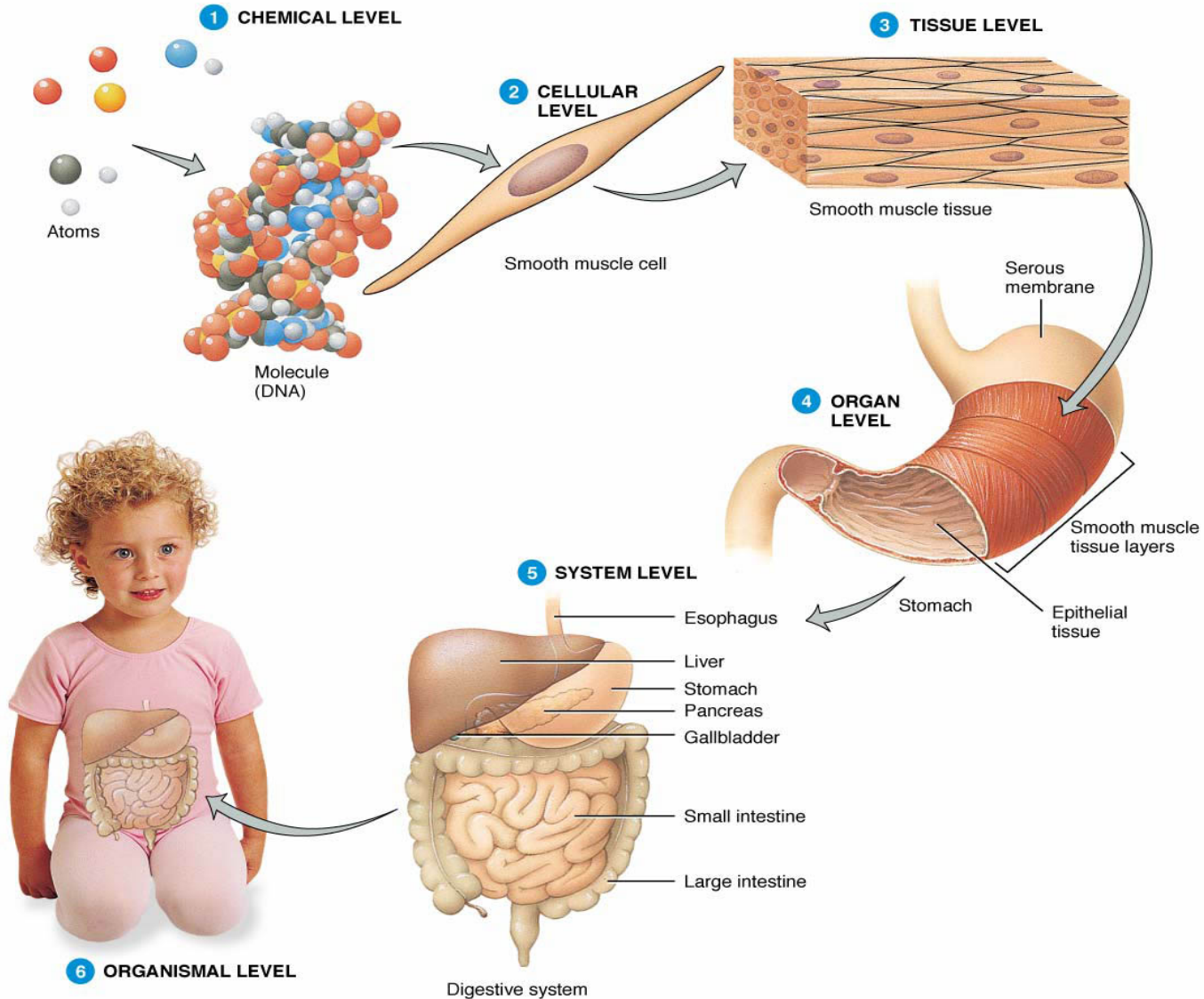


CAVITIES

Body Cavities



STRUCTURAL ORGANIZATION



STRUCTURAL ORGANIZATION

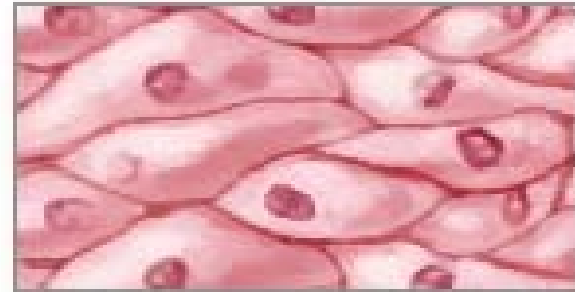
- Chemical
- Cellular
- Tissue
- Membrane
- Organ
- Body system

TISSUE TYPES

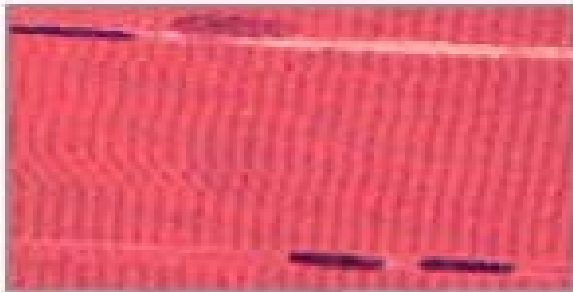
Four types of tissue



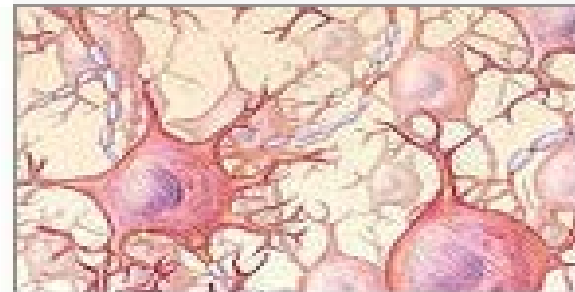
Connective tissue



Epithelial tissue



Muscle tissue



Nervous tissue

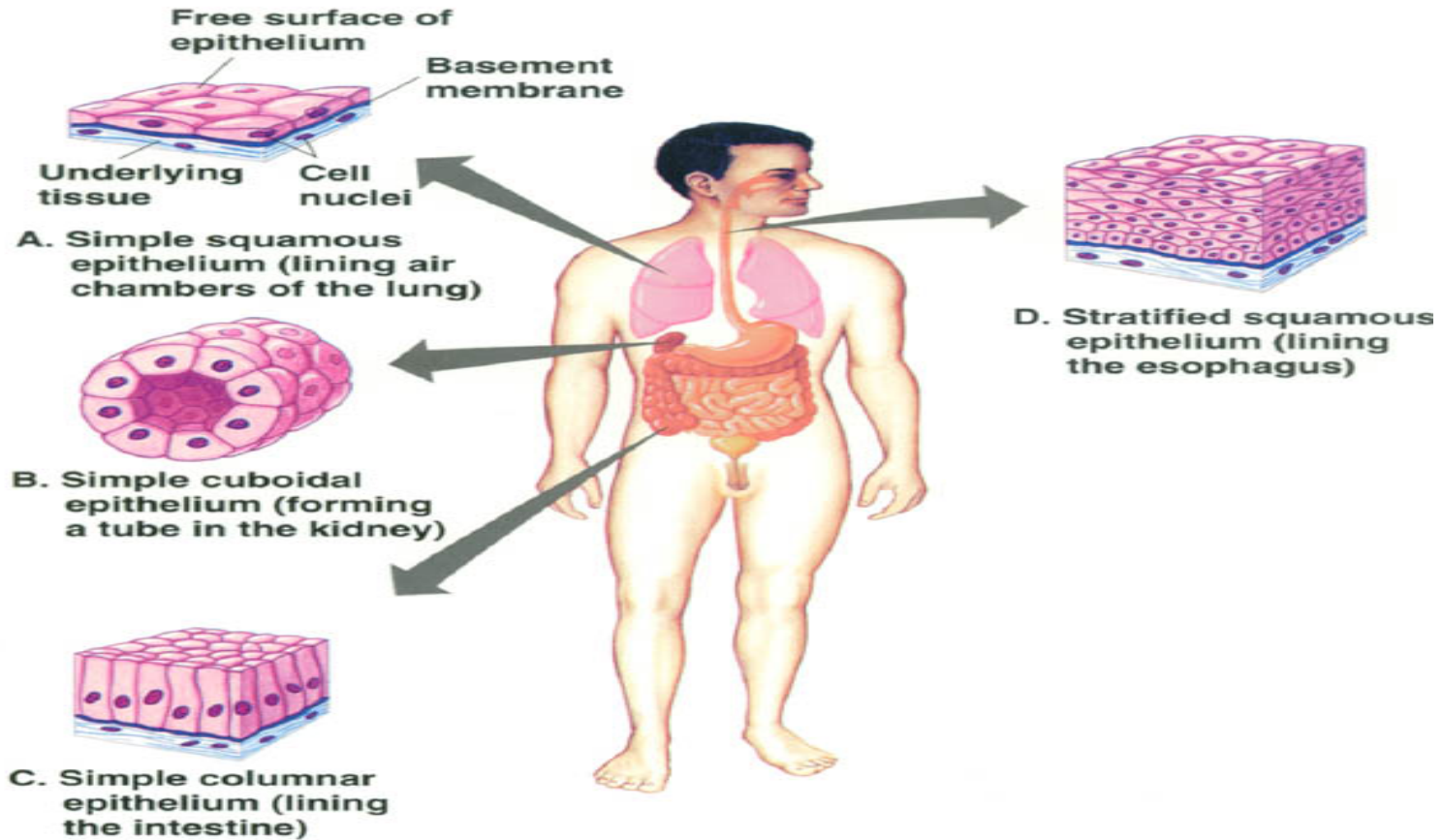
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TISSUES

- Four major types of *tissue* that perform specific functions
 - 1) **Epithelial tissue**
 - Lines the external body surfaces and internal surfaces of digestive and respiratory tracts blood vessels and ducts; makes up sense organs
 - Glandular epithelium makes up the secreting portion of glands

EPITHELIAL TISSUE

20.4 Epithelial tissue



CONNECTIVE TISSUE

- **2) Connective tissue**
 - Binds, supports, and protects the body organs
 - Based on the cell type

 - Ex. Cartilage, Bone, Vascular tissue

CONNECTIVE TISSUE

- **Cartilage-dense connective tissue**
 - Cell type is chondrocyte
 - Chondromalacia
 - Articular-joints
 - Costal-end of the ribs
 - Intervertebral discs, external ear, nose, trachea, etc.

CONNECTIVE TISSUE

- **Bone**
 - Firm, specialized connective tissue
 - Two types-
 - Compact-dense out layer
 - Cancellous-spongy-looking inner
 - Cell type-osteocyte (osteoblasts & osteoclasts)
 - Calcium and phosphate deposits within the bone give it strength

CONNECTIVE TISSUE

- **Dentin**
 - Connective tissue that forms teeth
 - Closely related to bone, but harder and denser
 - Enamel covers crown of teeth

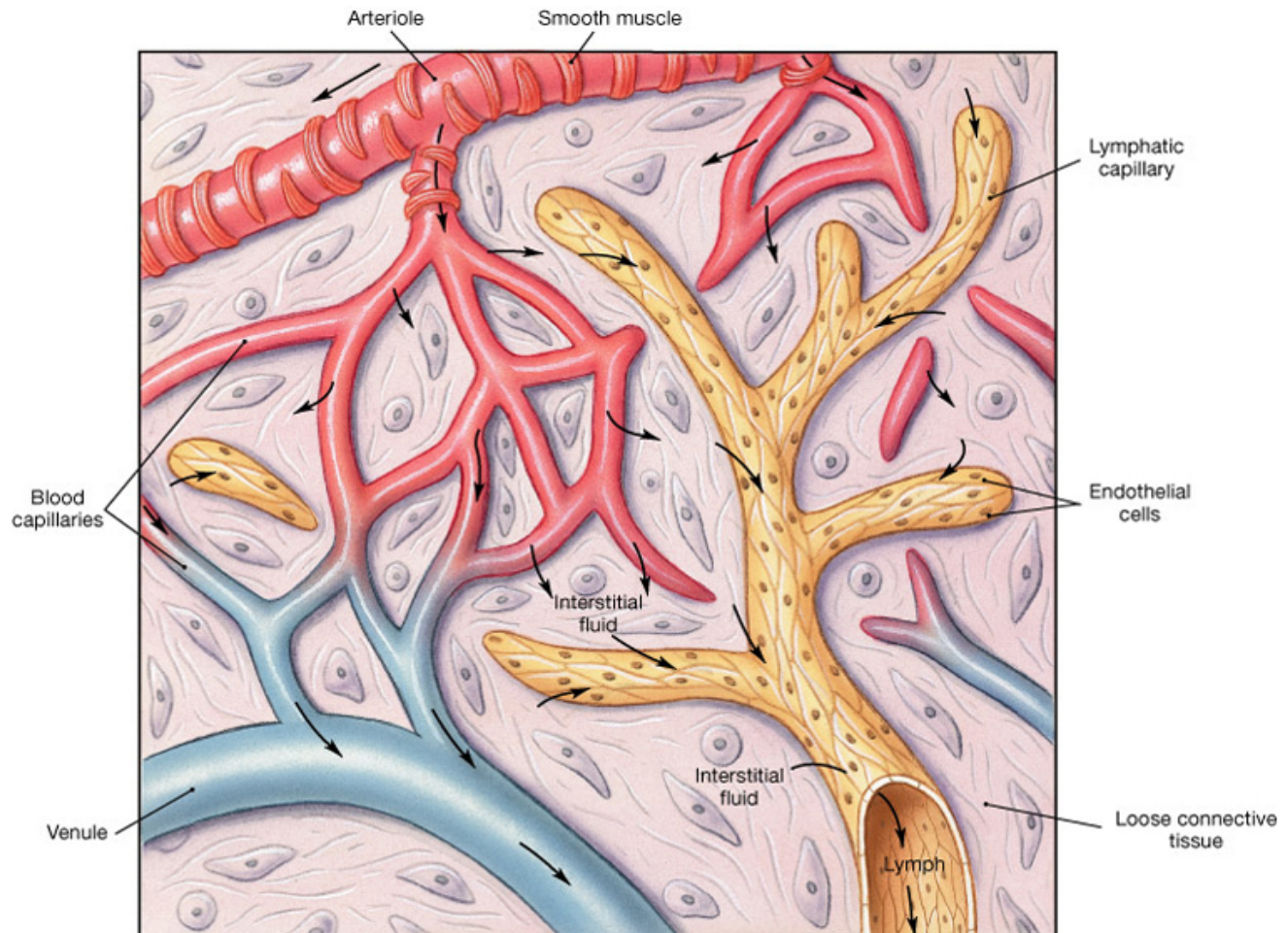
CONNECTIVE TISSUE

- **Blood**-liquid tissue circulating through the body
 - Functions to carry oxygen, nutrients, enzymes, waste products, hormones
 - Provides protection through white blood cells (leukocytes)
 - Temperature regulation

CONNECTIVE TISSUE

- **Lymph**-fluid composed of water, protein, fats, and salt.
- Functions to transport fluid, proteins, etc. from the tissues to the circulatory system
- Lymphatic vessels carry the lymph
- Cell type-lymphocytes and granulocytes

LYMPH



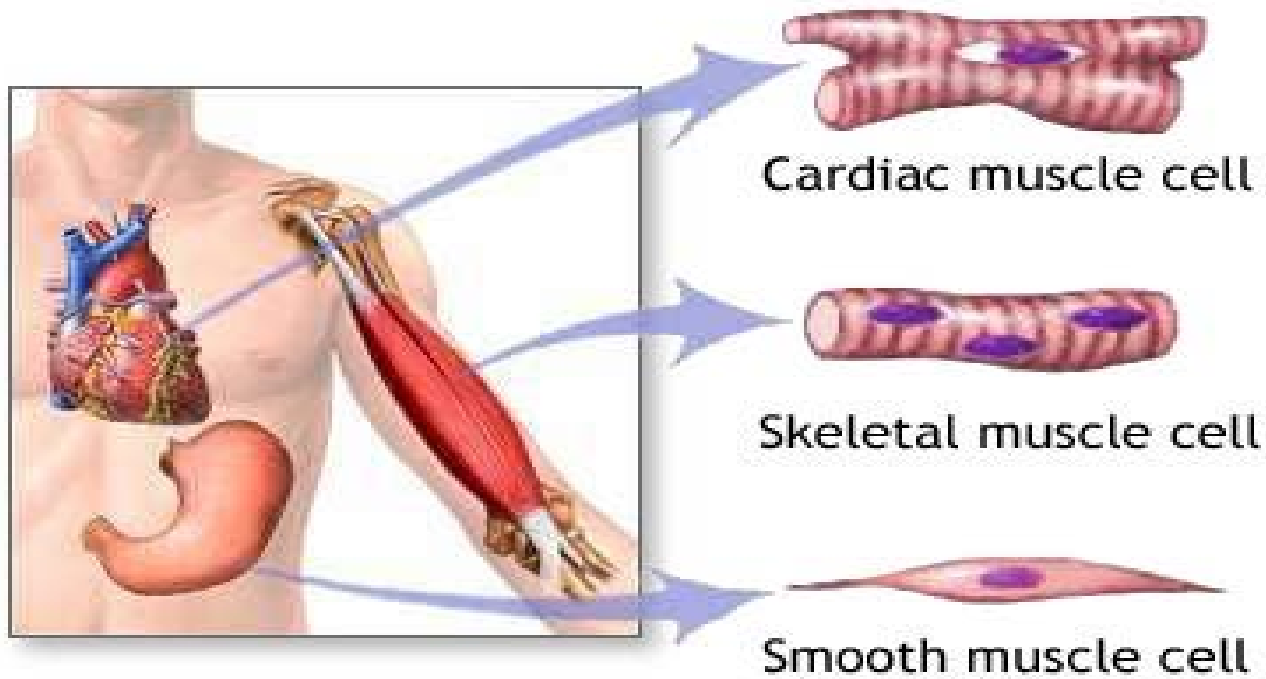
(a) Association of blood capillaries, tissue, and lymphatic capillaries

MUSCLE TISSUE

3) Muscle

- Three types-skeletal, smooth, and cardiac
- Highly specialized cells make up muscle tissue
- Basic function is to contract (shorten)

MUSCLE TISSUE



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MUSCLE TISSUE

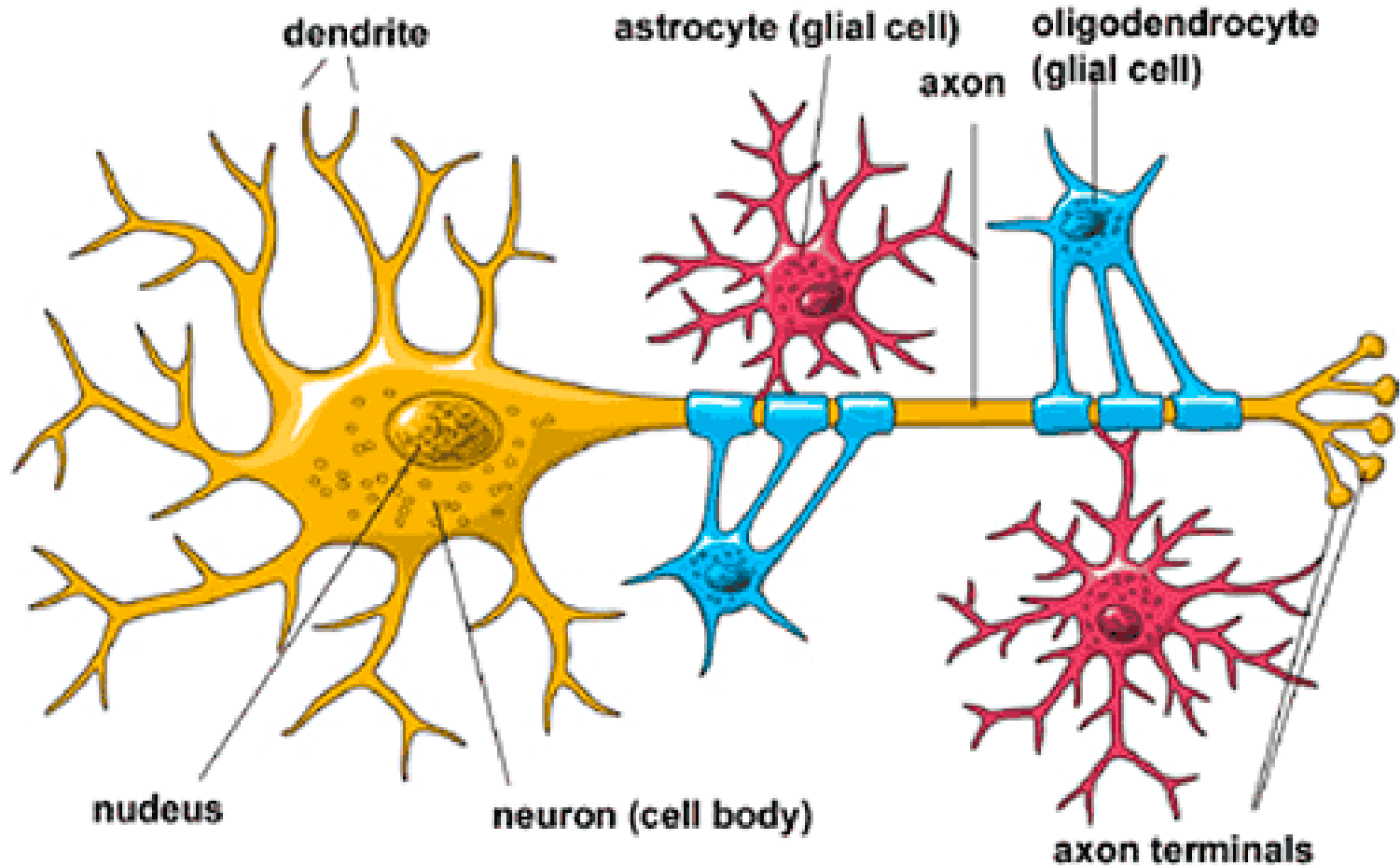
- **Smooth muscle**-involuntary movements
 - Lines digestive, urinary, respiratory tracts, blood vessel walls, lymph vessels
- **Skeletal muscle**-voluntary movements (consciously control)
 - Attached to bones, tendons, and other muscles
- **Cardiac muscle**-involuntary heart contractions

NERVOUS TISSUE

4) Nervous

- Most highly organized tissue of the body
- Makes up the brain, spinal cord, and nerves
- *Neurons* generate and send impulses from one part of the body to another
- *Glial cells* bind neurons together

NERVOUS TISSUE



NERVOUS TISSUE

- Function to send electrical impulses throughout the body, controlling and coordinating movements and activities

MEMBRANES

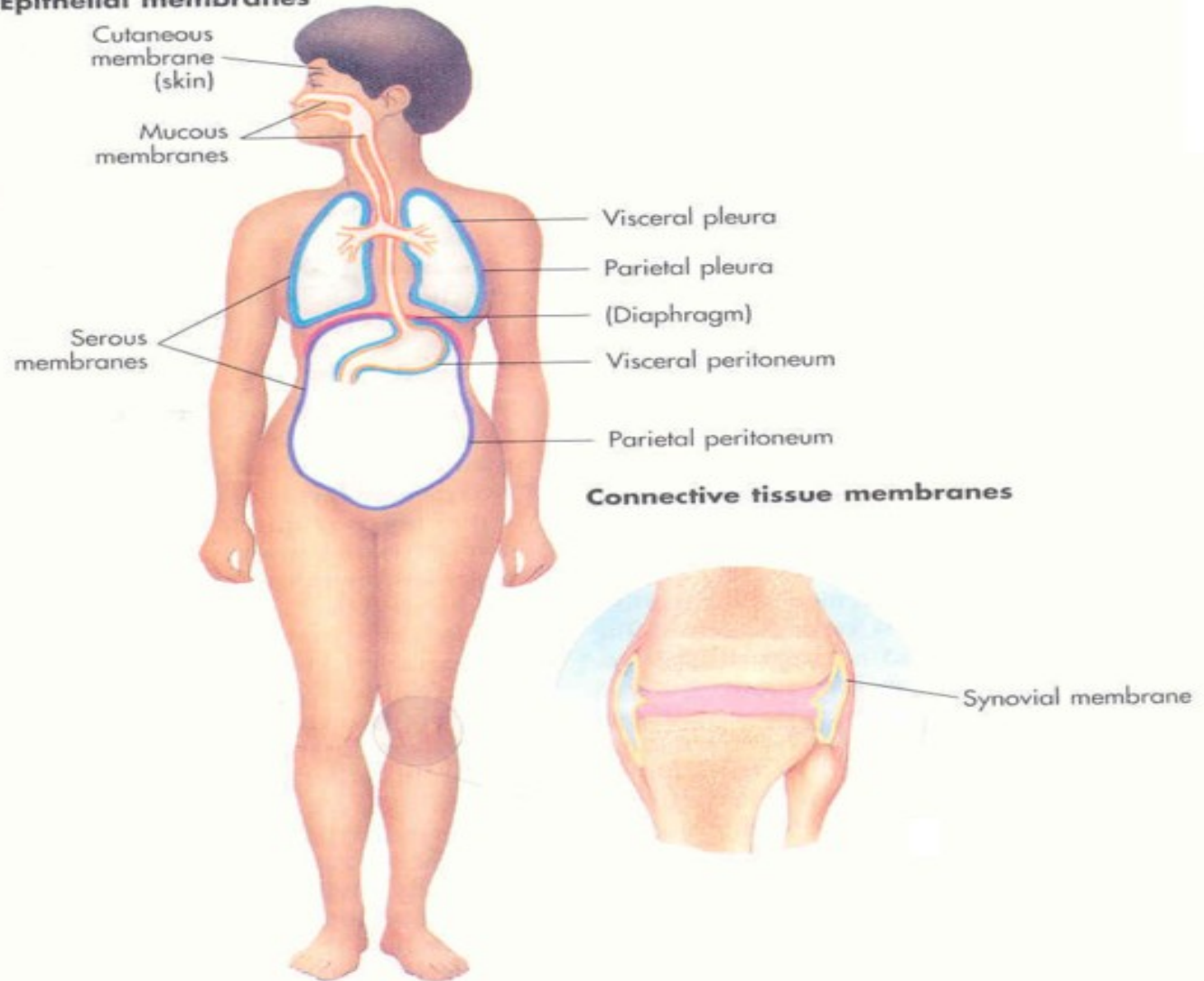
- Thin tissues that covers the body and organs and lines hollow cavities and organs

MEMBRANES

- Classified according to function
 - **Cutaneous membranes**-skin
 - **Mucous membranes**-
 - Line organs that have an opening to the outside of the body (respiratory, digestive tract)
 - **Serous membranes**-
 - Line body cavities and the exterior of organs that do not open to the outside of the body (pleura lining the thoracic cavity)
 - **Synovial membranes**

MEMBRANES

Epithelial membranes



ORGANS

- Tissues combine together in organs to perform specific functions



BODY SYSTEM

- Organs work together to perform specific functions



A & P.... WHY NOW?

- Increased specificity requirements of ICD-10

I69.052-Hemiplegia & hemiparesis following nontraumatic subarachnoid hemorrhage affecting left dominant side

I69-Sequelae of cerebrovascular disease

0-nontraumatic subarachnoid hemorrhage

5-Hemiplegia & hemiparesis

2-left dominant side

MORE CODES AND MORE DETAIL

ICD-9-CM

466.0 Acute Bronchitis

ICD-10-CM

- J20.0 Acute bronchitis due to Mycoplasma
- J20.1 Acute bronchitis due to streptococcus
- J20.3 Acute bronchitis due to coxsackievirus
- J20.4 Acute bronchitis due to parainfluenza virus
- J20.5 Acute bronchitis due to respiratory syncytial virus
- J20.6 Acute bronchitis due to rhinovirus
- J20.7 Acute bronchitis due to echovirus
- J20.8 Acute bronchitis due to other specified organisms
- J20.9 Acute bronchitis, unspecified

CALCANEUS FRACTURE

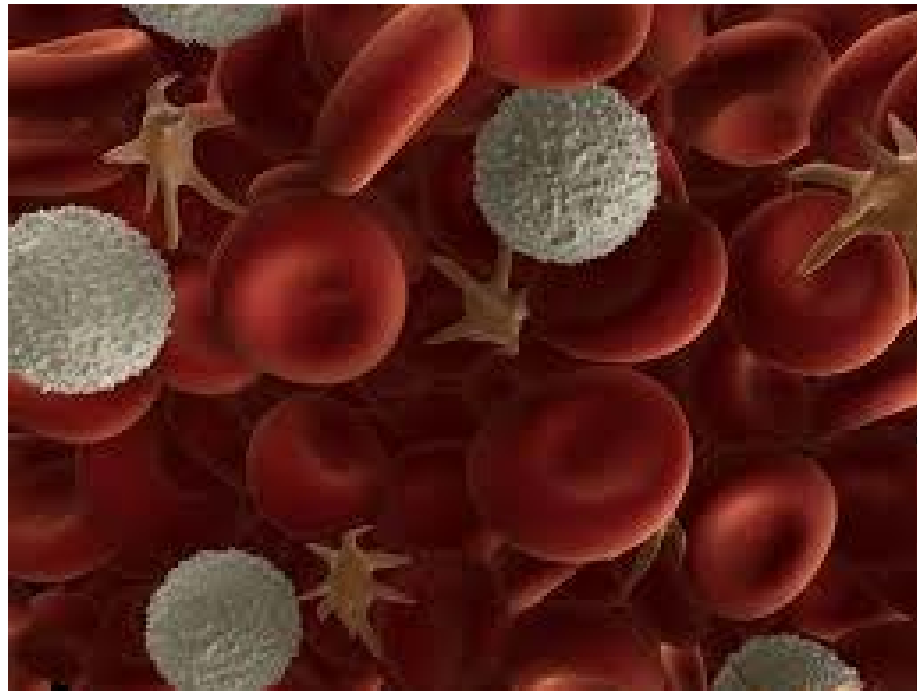
ICD-9-CM

- Fracture of calcaneus, closed 825.0
- Fracture of calcaneus, open 825.1

ICD-10-CM

- S92.061A
- Displaced intraarticular fracture of R calcaneus, Initial encounter for closed fracture

HEMATOPOIETIC & IMMUNE SYSTEM

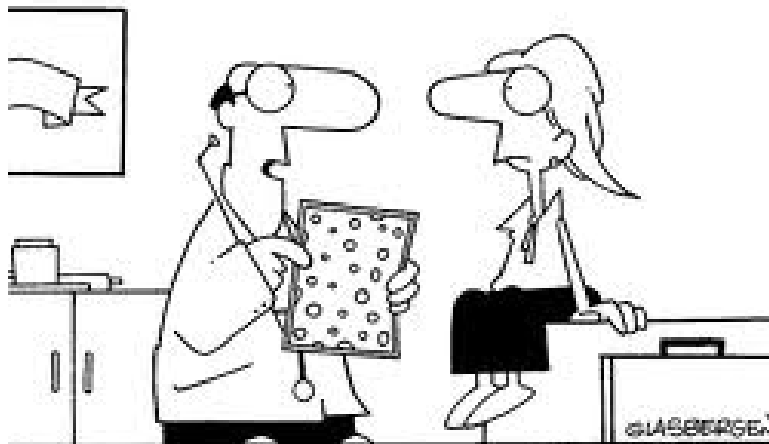


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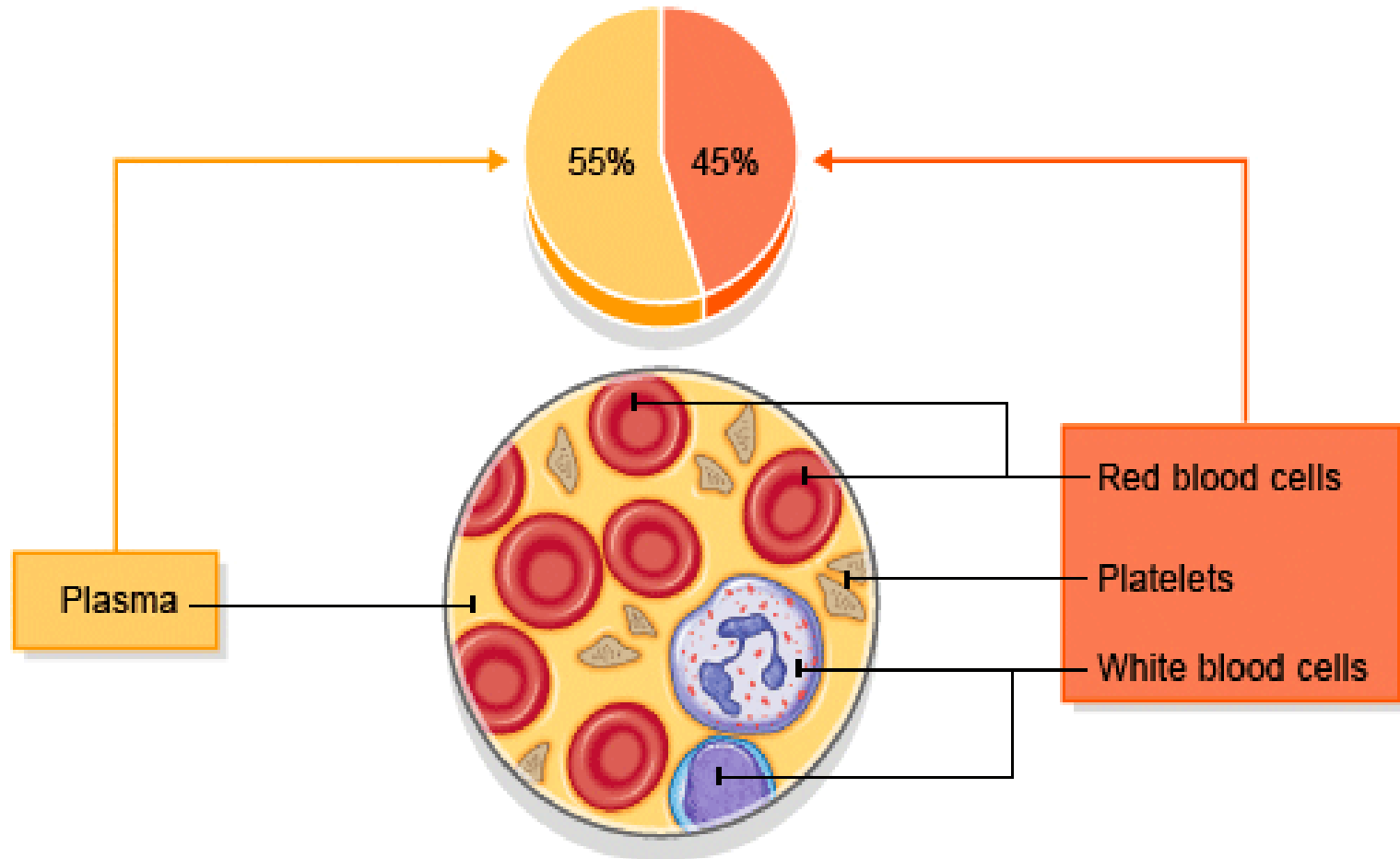
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**"The red blobs are your red blood cells.
The white blobs are your white blood cells.
The brown blobs are coffee. We need to talk."**

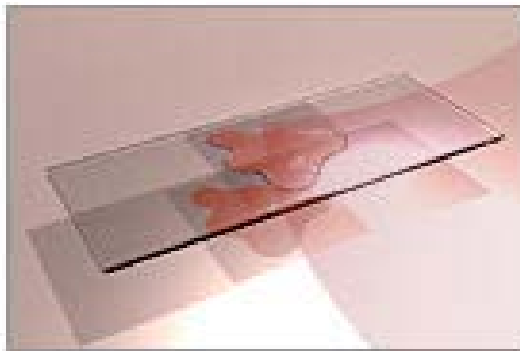
BLOOD COMPOSITION



BLOOD COMPONENTS

- Leukocytes-WBC
- Erythrocytes-RBC
- Thrombocytes-PLT
- Plasma

BLOOD COMPONENTS



Eosinophil

Neutrophil

Basophil

Red blood cell

Lymphocyte

Monocyte

Platelet

 ADAM.

BLOOD SMEAR

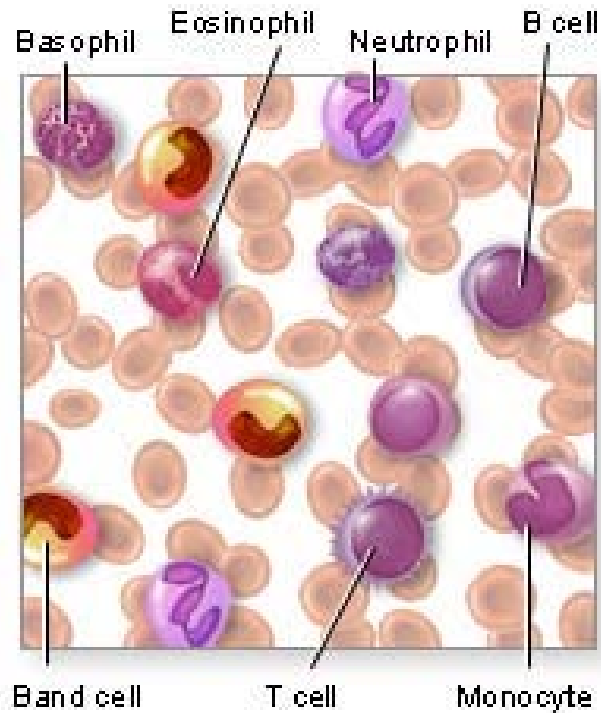


WBC COMPONENTS

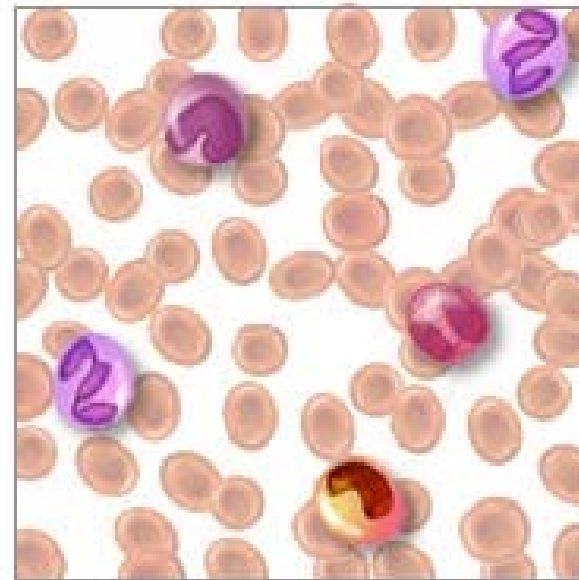
- **Granulocytes**
 - Neutrophils 60-70%
 - Basophils 1%
 - Eosinophils 4-6%
- **Agranulocytes**
 - Lymphocytes 20-25%
 - Monocytes 3-8%
- Constant proportion in *healthy* individual

BLOOD CELLS

High WBC count



Low WBC count



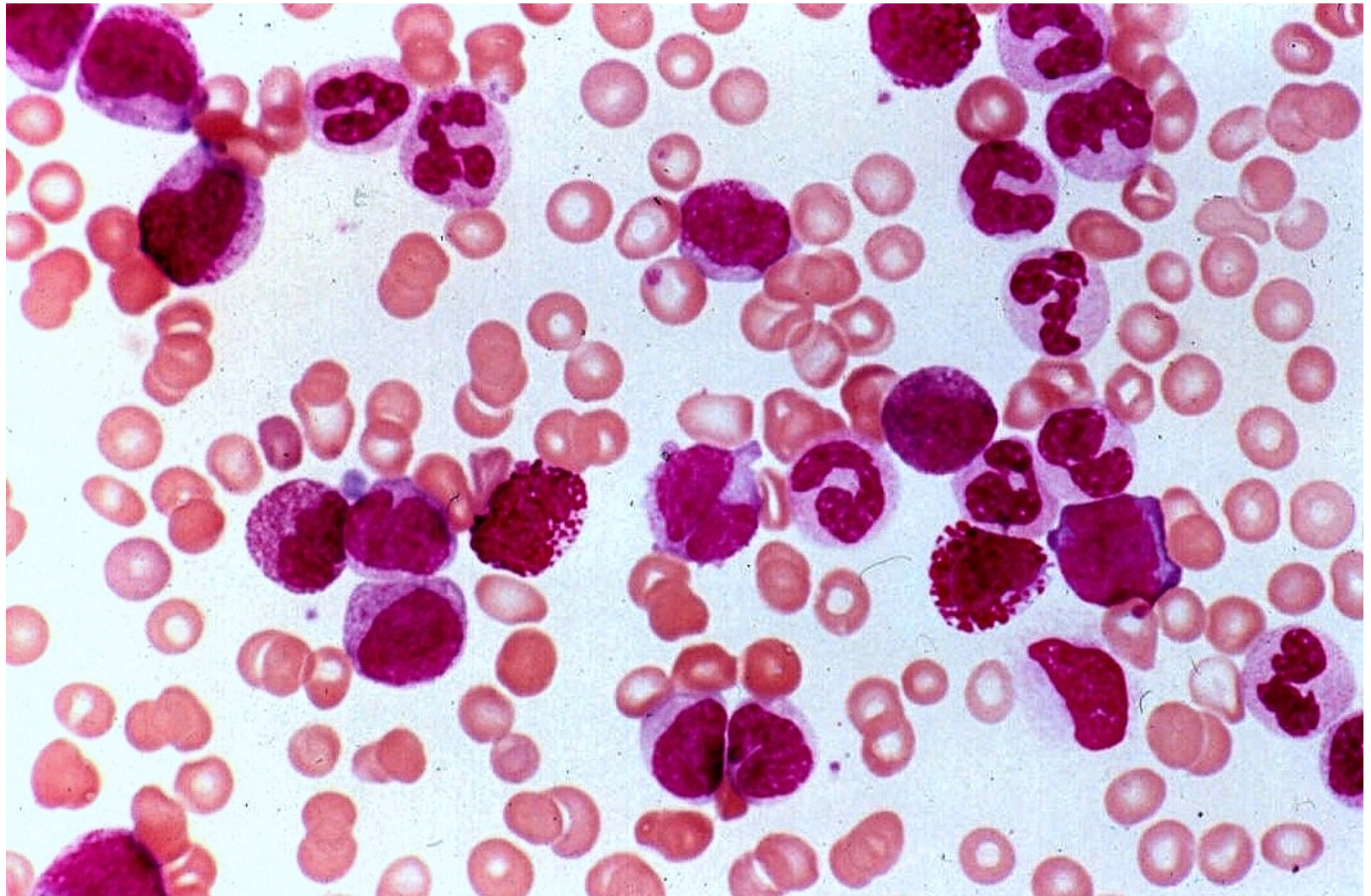
WBC

- Affected by infection or inflammatory process in the body
- Conditions that affect production in the bone marrow or survival in the bloodstream
- Normal WBC count 3.5-10.5 billion cells/L

WBC FUNCTION

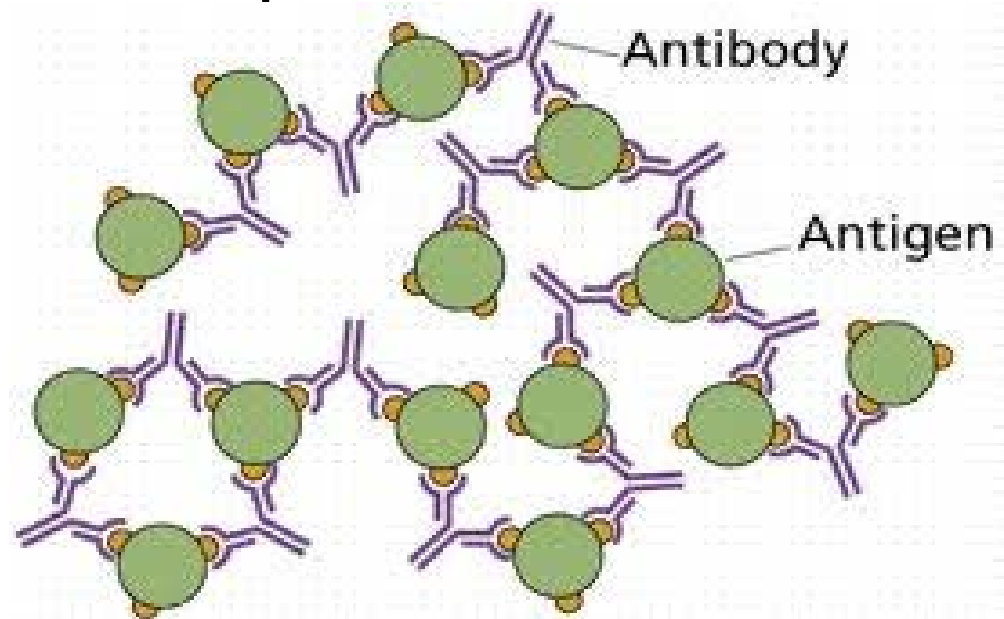
- Fight infection and inflammation
- Phagocytic
- Antigen-antibody response (lymphocytes)

ABNORMAL BLOOD SMEAR

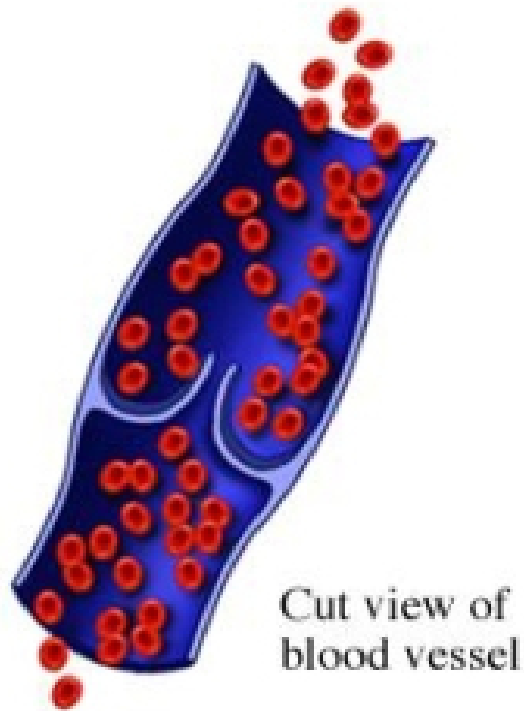


ANTIGEN-ANTIBODY RESPONSE

- Provide immunity to disease
- ABO blood types
- Allergies and allergic reaction
- Organ transplant rejection



RBC



Red blood cell



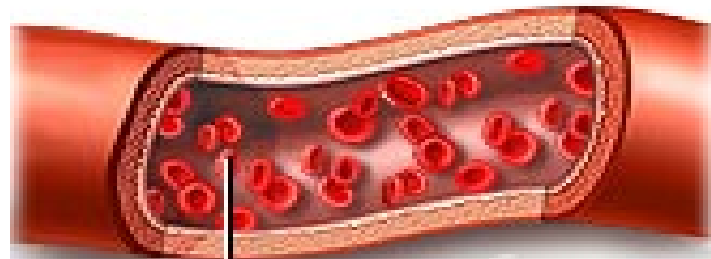
RBC FUNCTIONS

- Oxygen transport in the body

33% of RBC volume = hemoglobin-Hgb

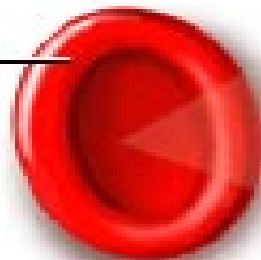
Heme-iron containing red pigment
Globin-protein component

HEMOGLOBIN

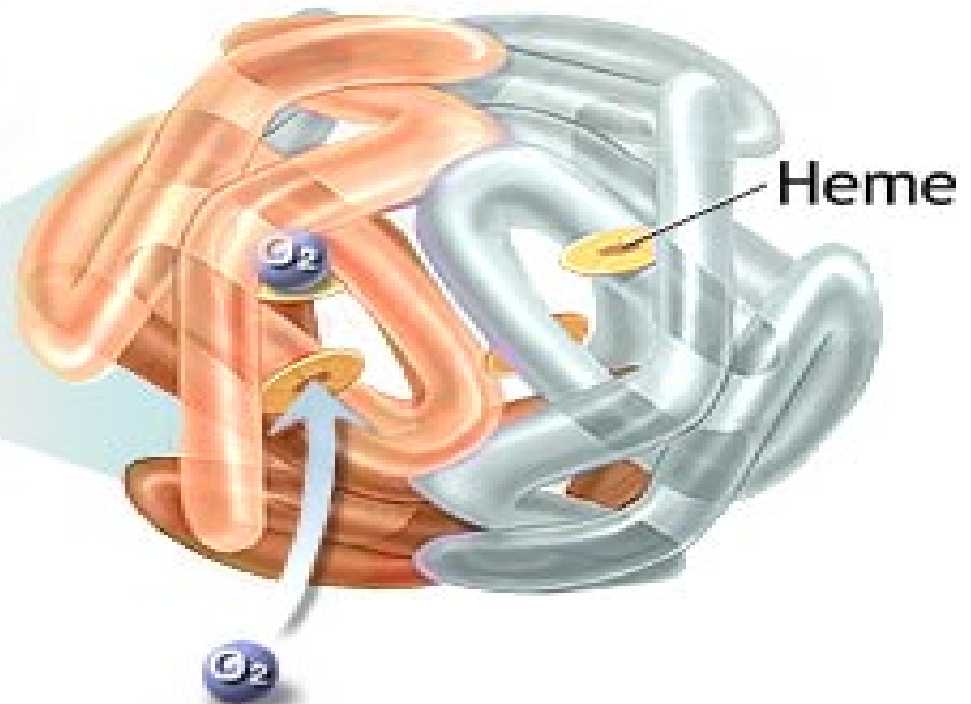


Red blood cell

Red blood cells contain several hundred thousand hemoglobin molecules, which transport oxygen



Hemoglobin molecule



Oxygen binds to heme on the hemoglobin molecule

RBC LIFE SPAN

- 120 days
 - Body must continually produce RBC.
- Where?-Bone Marrow
- Anemia-reduction in number of functional RBC or reduced hemoglobin content

LABORATORY VALUES

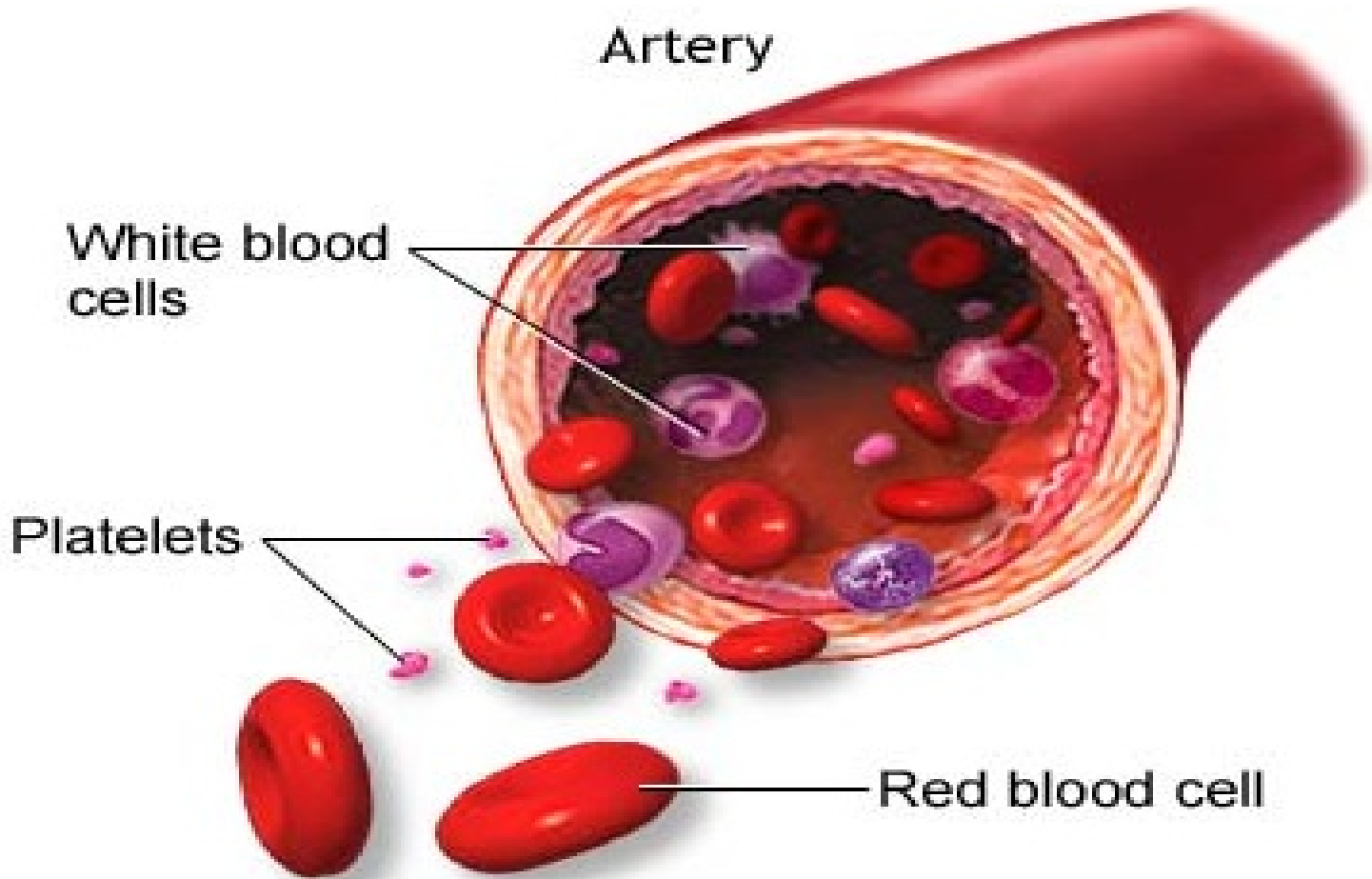
Hemoglobin

- Male: 13.5-17.5 gm/dL
- Female: 12.0-15.5 grams/dL

Hematocrit

- Male: 38.8-50.0 %
- Female: 34.9-44.5 %

PLATELETS



FUNCTION

- Prevent fluid (blood) loss
- Platelets adhere to damaged blood vessel initiating the clotting cascade
- Over a dozen different clotting factors secreted, resulting in fibrin strands and eventually blood clot

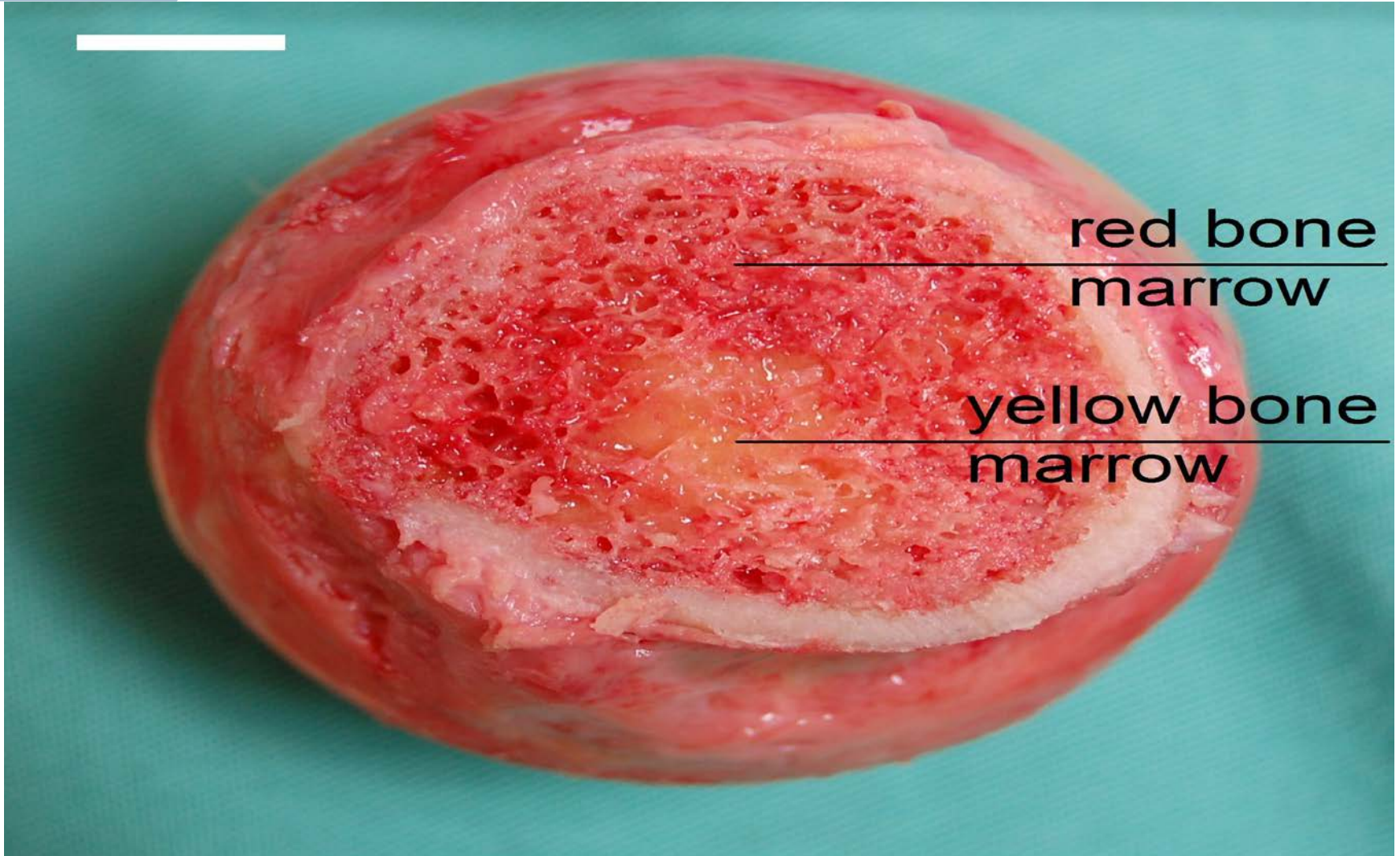
LABORATORY VALUES

- Platelet count: 150-450 billion/L



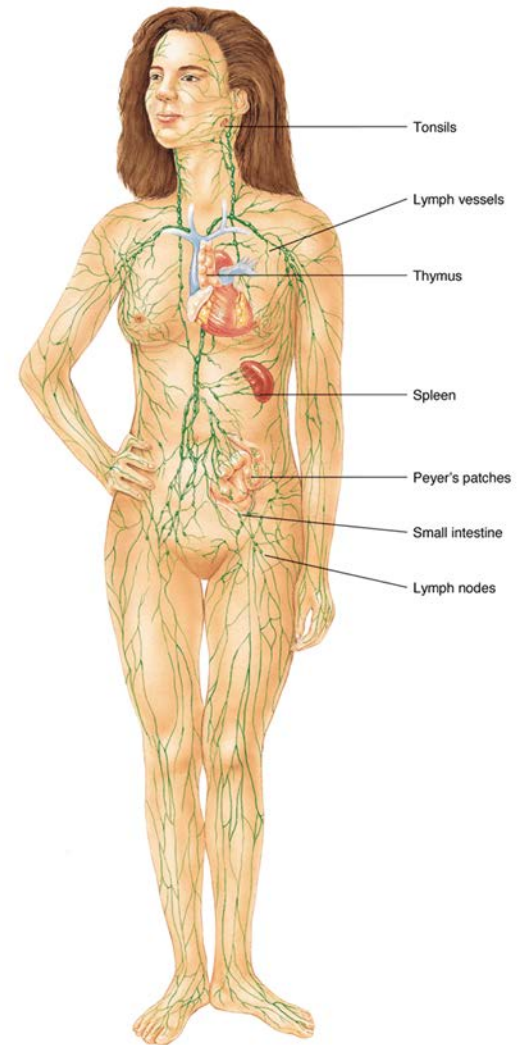
- Laboratory reference values. Hematology group. Rochester, Minn.: Mayo Foundation for Medical Education and Research; December 2010.

MYELOID TISSUE

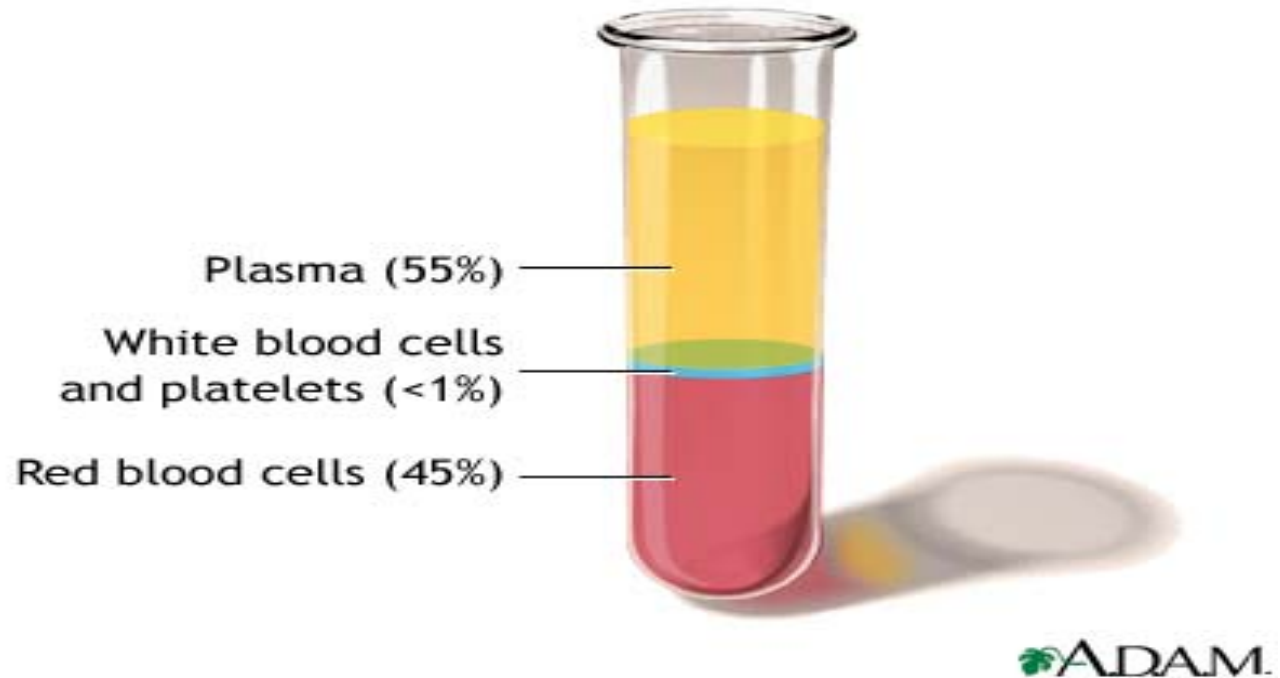


LYMPHATIC TISSUE

- Lymph nodes, spleen, tonsils, adenoids, and thymus



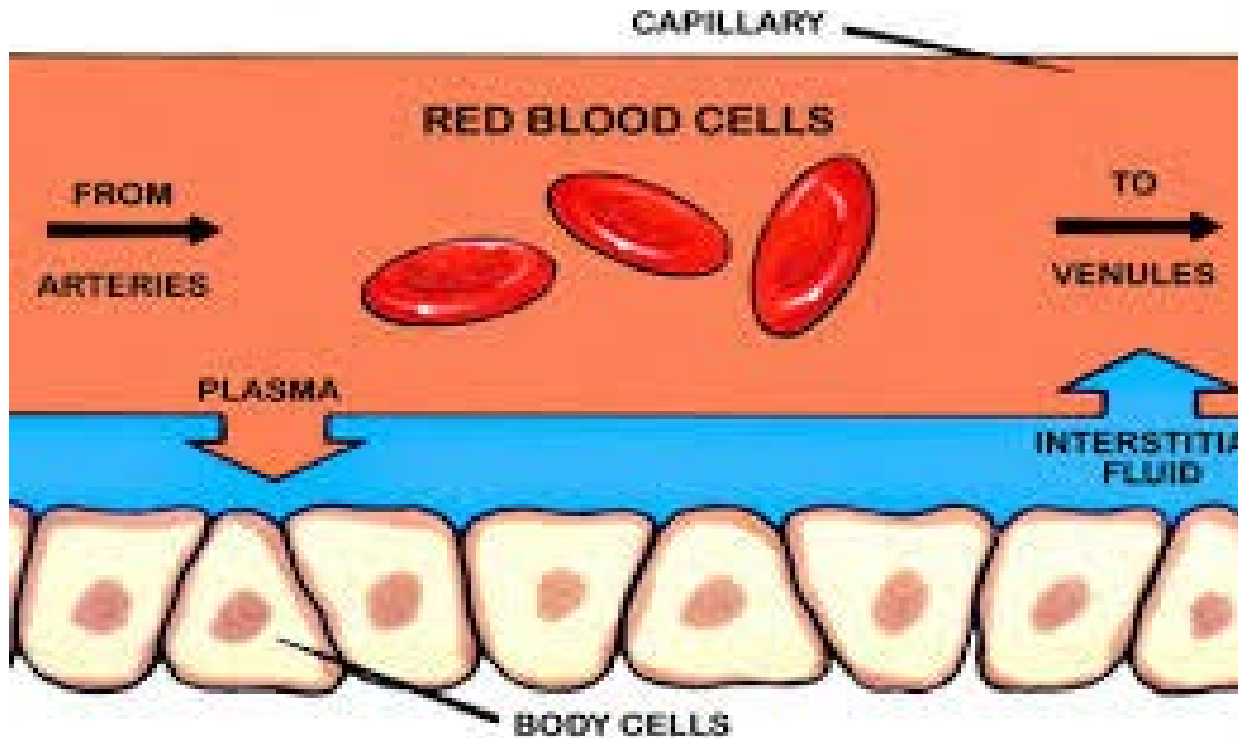
BLOOD



- Liquid element-plasma
- Formed elements-cells

INTERSTITIAL FLUID

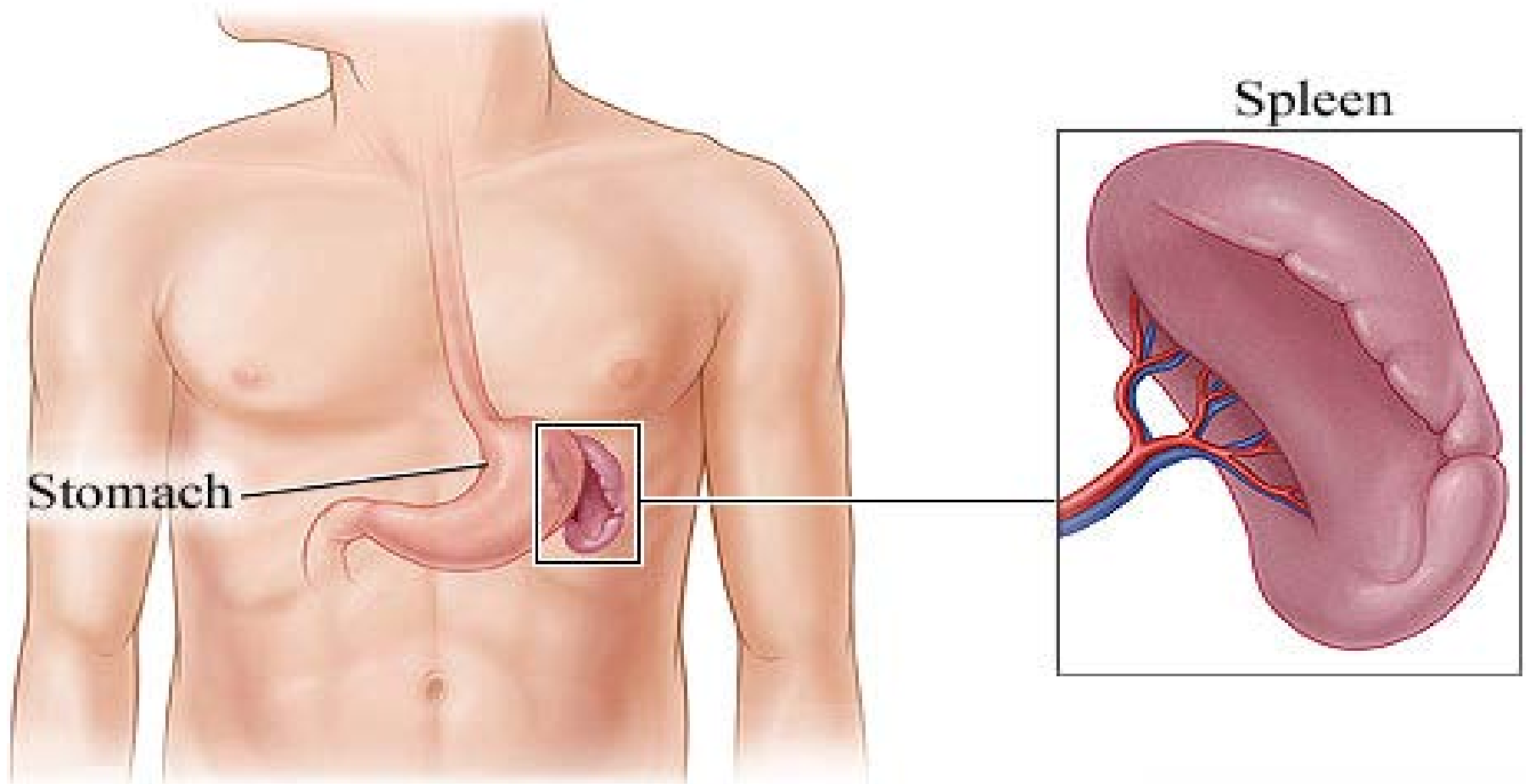
- Fluid in spaces between the cells of the body



INTERSTITIAL FLUID

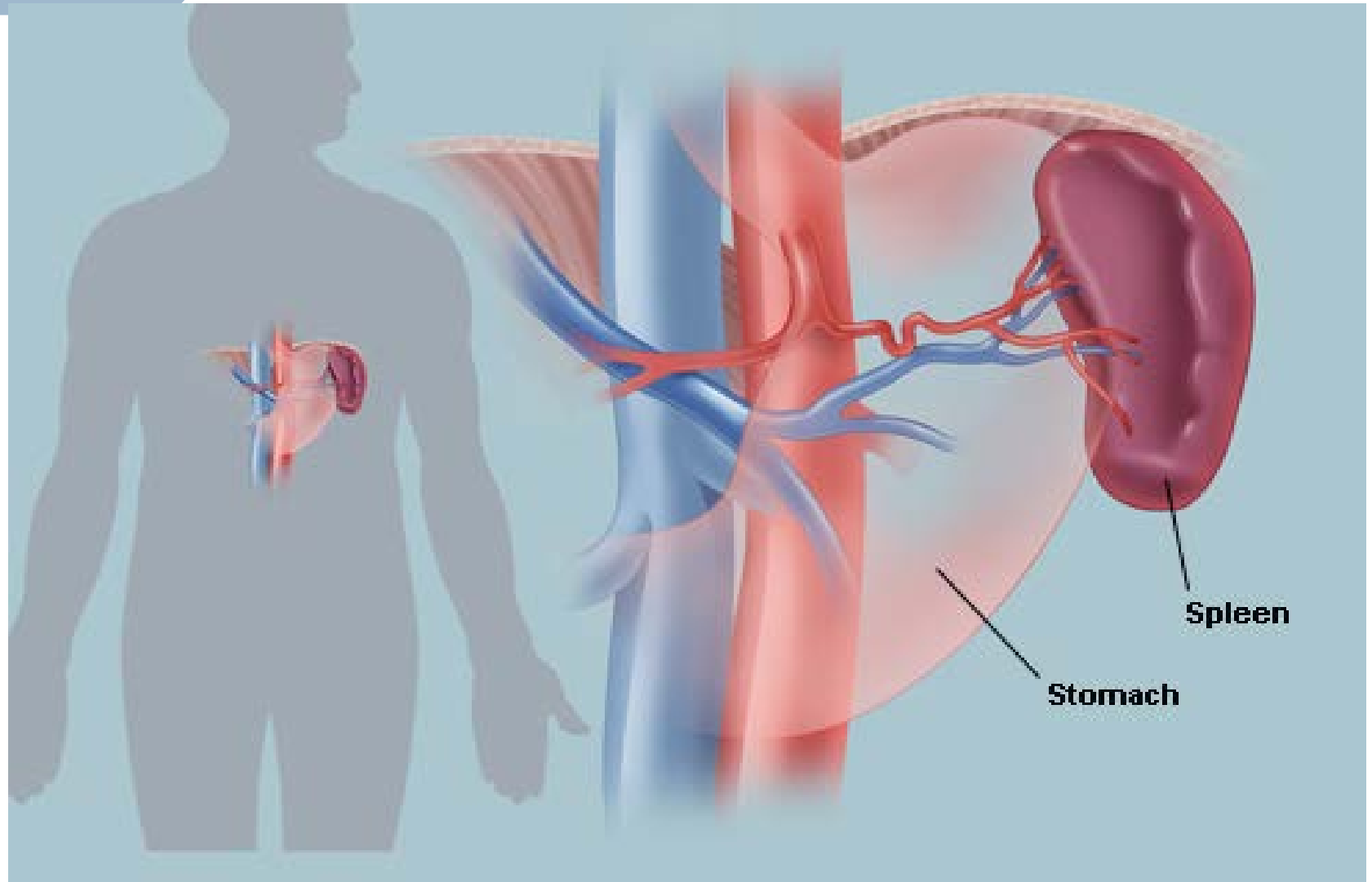
- Also called extracellular fluid
- Makes up 1/3 of the water in the body
- Accounts for 20% of body weight

SPLEEN



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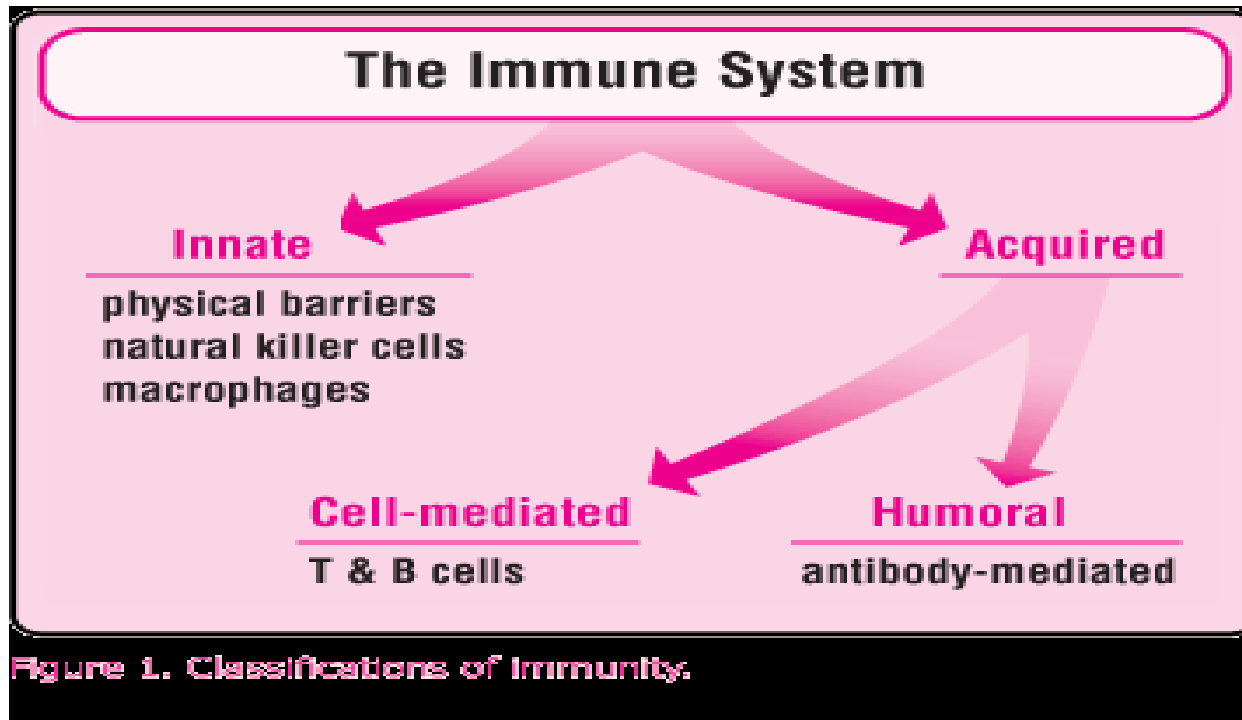
SPLEEN



FUNCTION

- Removal of pathogens, damaged/old RBC, blood storage and release during hemorrhage
- Production of lymphocytes, monocytes, and plasma cells in response to bacteria or viruses
- Blood storage
- Defense against disease-producing organisms

IMMUNE SYSTEM



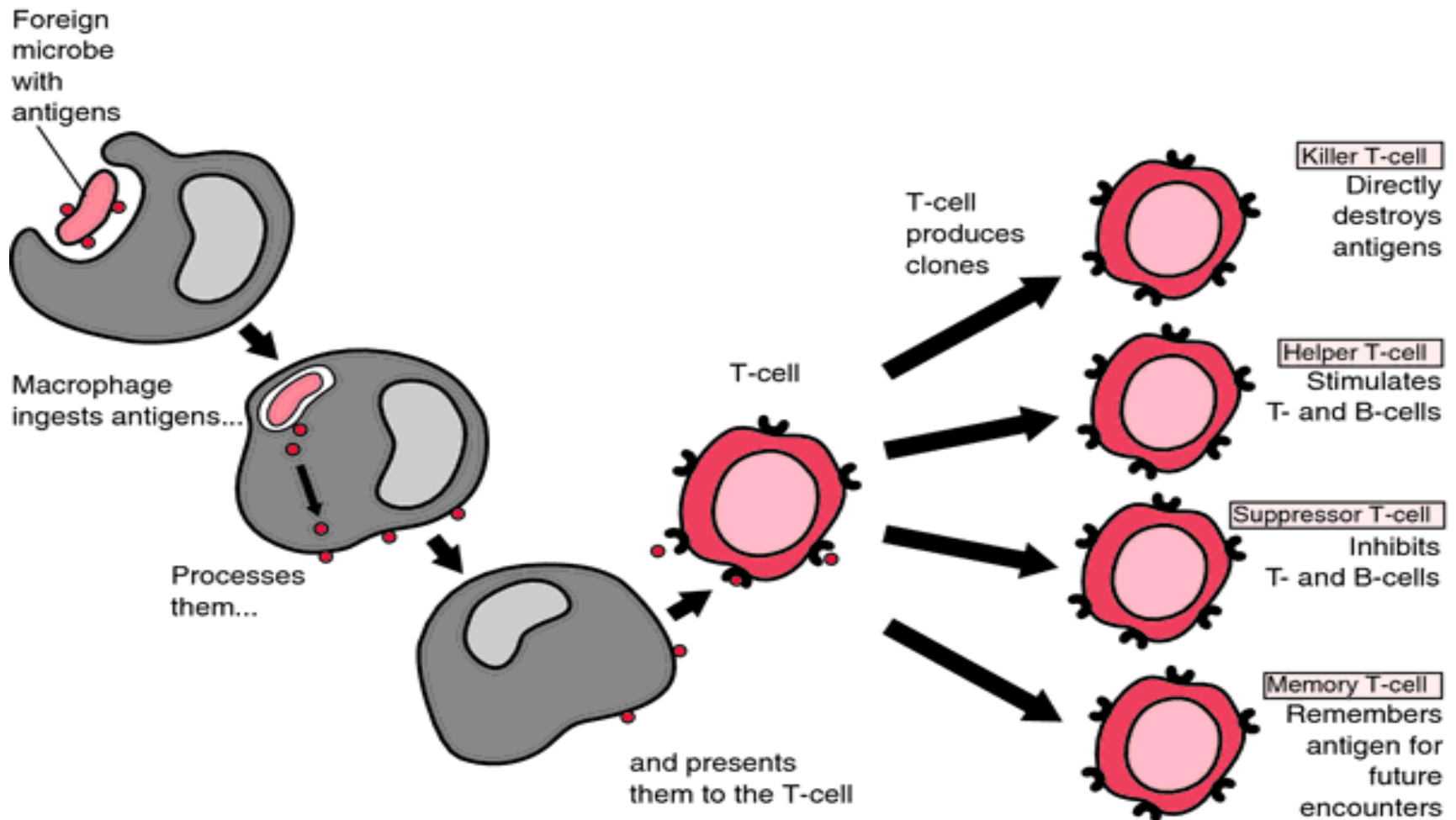
NON-SPECIFIC DEFENSE

- Skin-protects underlying structures and produces substances (sweat) that are toxic to many pathogens
- Mucous Membranes-eye, nose, mouth produce lysozyme which can destroy microorganisms
- Mucus in respiratory tract-traps pathogens
- Phagocytic WBC-destroy organisms that penetrate skin/ mucous membranes

SPECIFIC DEFENSE

- **Cell-mediated immunity**
 - Lymphocytes attack pathogens directly
- T-cells
 - Killer T-cells
 - Helper T-cells
 - Suppressor T-cells
 - Memory T-cells
-

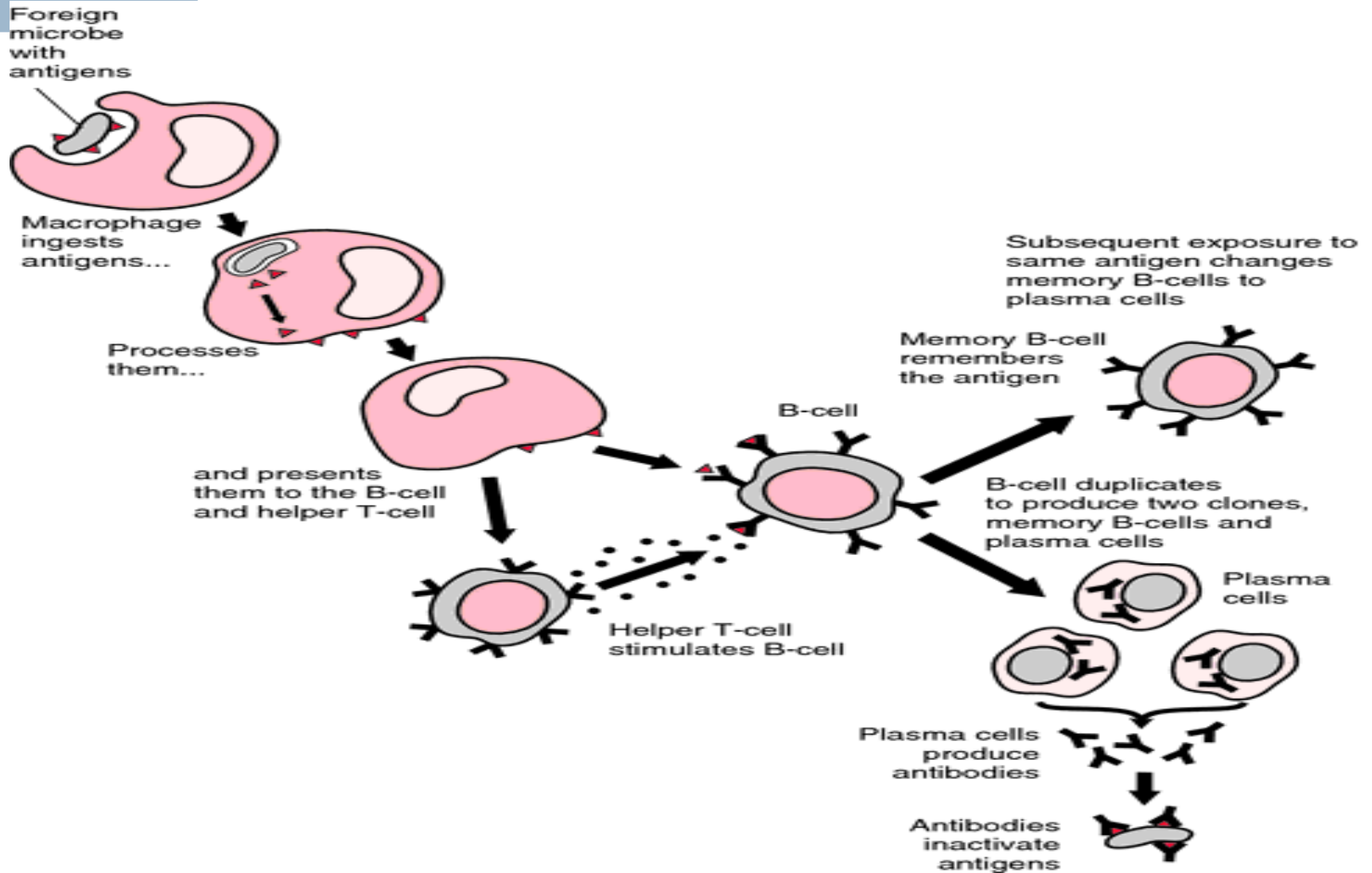
CELL MEDIATED IMMUNITY



SPECIFIC DEFENSE

- **Antibody-Mediated Immunity**
- Antibody-protein produced by plasma cells in response to presence of an antigen
- B-Cells responsible for antibody-mediated immunity

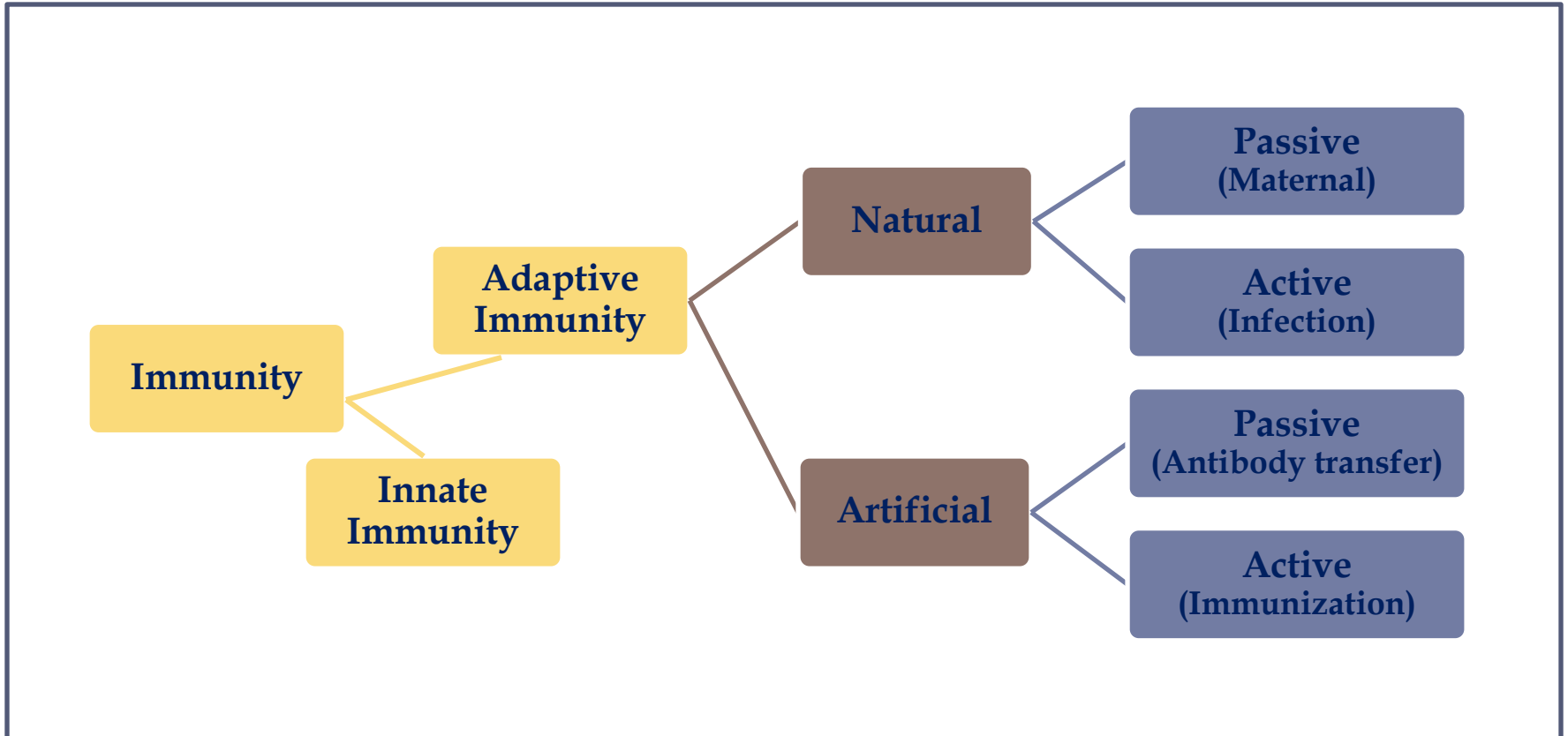
ANTIBODY MEDIATED IMMUNITY



SPECIFIC DEFENSE

- Antibodies = Immunoglobulins
 - *IgG- most abundant-fight bacteria/viruses*
 - *IgA- in tears, mucous membranes, breast milk, and saliva to protect from pathogens*
 - *IgM-cause clumping of RBC (agglutination) and attach to antigen*
 - *IgE-stimulate histamine release causing allergic reaction*
 - *IgD-bind to antigens activating B-cells*

IMMUNITY



IMMUNE SYSTEM

- **Immune and Circulatory systems (blood and lymph) must work together to provide defense against pathogens!**

BLOOD TYPING

- Method to determine the specific type of blood in the body
- Type is dependent on the presence or absence of certain proteins, called antigens, on the RBC

BLOOD TYPE

- Type A
- Type B
- Type AB
- Type O
 - Rh+ or Rh-

BLOOD TYPING

| Blood Type | Cell Antigen | Serum Antibodies | Donor |
|------------|--------------|------------------|--------|
| A | A | B | A or O |
| B | B | A | B or O |
| AB | AB | None | All |
| O | None | A and B | O |

Table 1. ABO Blood Groups



**It takes!
all types!**

GIVING = LIVING

BLOOD COMPATIBILITY

| Recipient ^[1] | Donor ^[1] | | | | | | | |
|--------------------------|----------------------|----|----|----|----|----|-----|-----|
| | O- | O+ | A- | A+ | B- | B+ | AB- | AB+ |
| O- | ✓ | | | | | | | |
| O+ | ✓ | ✓ | | | | | | |
| A- | ✓ | | ✓ | | | | | |
| A+ | ✓ | ✓ | ✓ | ✓ | | | | |
| B- | ✓ | | | | ✓ | | | |
| B+ | ✓ | ✓ | | | ✓ | ✓ | | |
| AB- | ✓ | | ✓ | | ✓ | | ✓ | |
| AB+ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

COMMON LAB TESTS

- Complete Blood Count (CBC)-measures RBC, WBC, Plt, Hgb, Hct
- CBC with differential-also includes type and percentage of WBC
- Hct-Percent of RBC in blood
- Hgb-Amount of Hgb in blood
- Plt-Number of platelets in blood
- PT/PTT-measures blood clotting time
- INR-International normalized ratio-

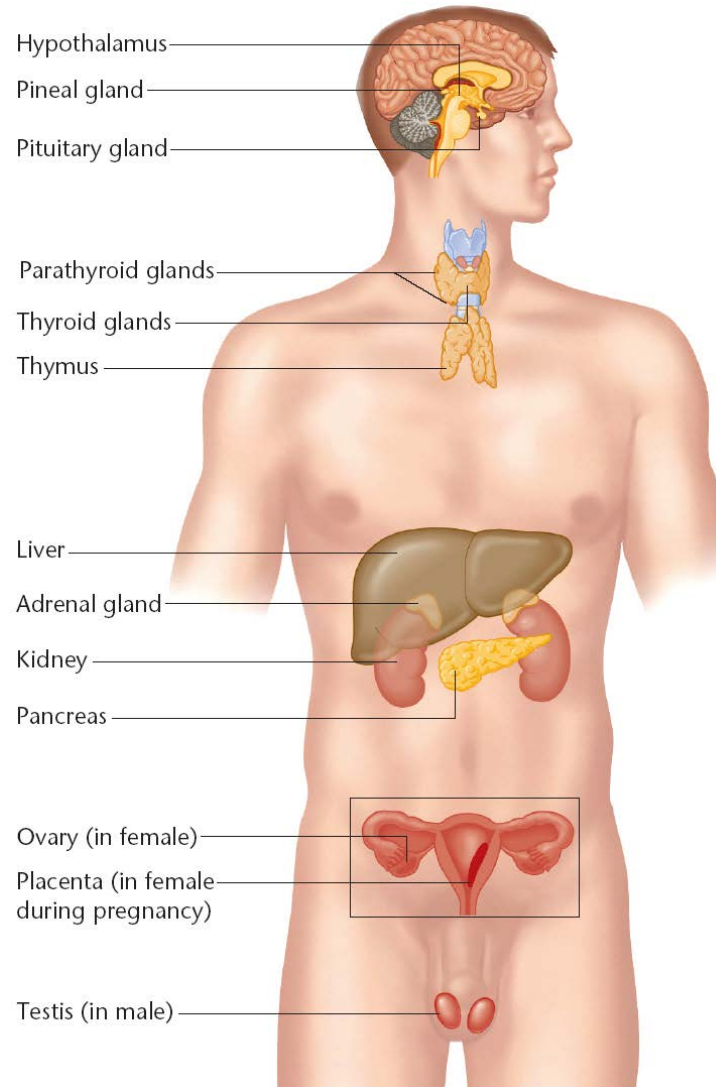
COMMON TESTS

- INR contd.- calculated from PT; used in monitoring anticoagulation therapy
- ESR-erythrocyte sedimentation rate-non-specific test associated with inflammation, infection, autoimmune diseases

ENDOCRINE SYSTEM

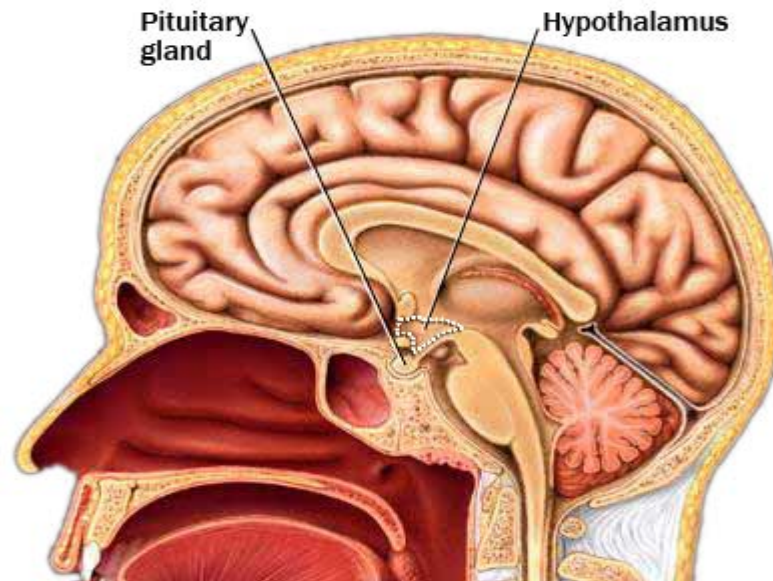


ENDOCRINE SYSTEM



ENDOCRINE SYSTEM

- Essential function is the maintain homeostasis
- Endocrine and central nervous system work together to regulate body functions

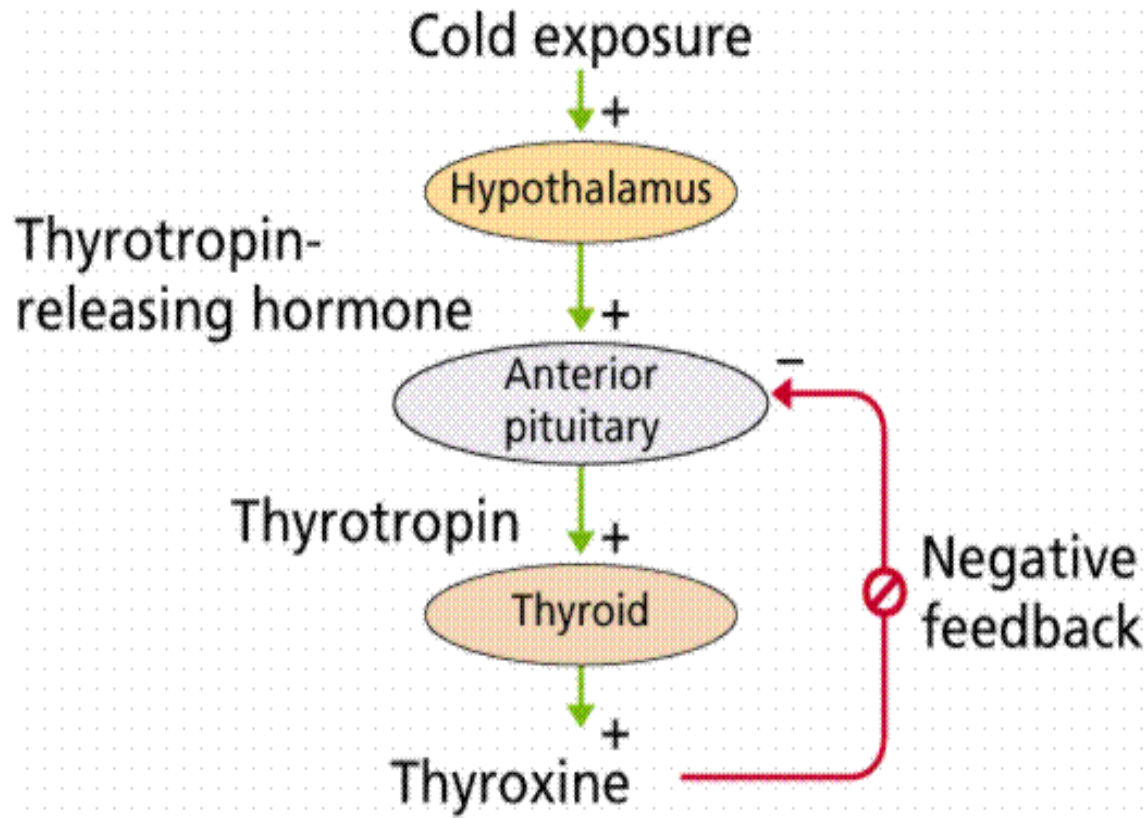


ENDOCRINE SYSTEM

- Endo- within
- Crine-to secrete

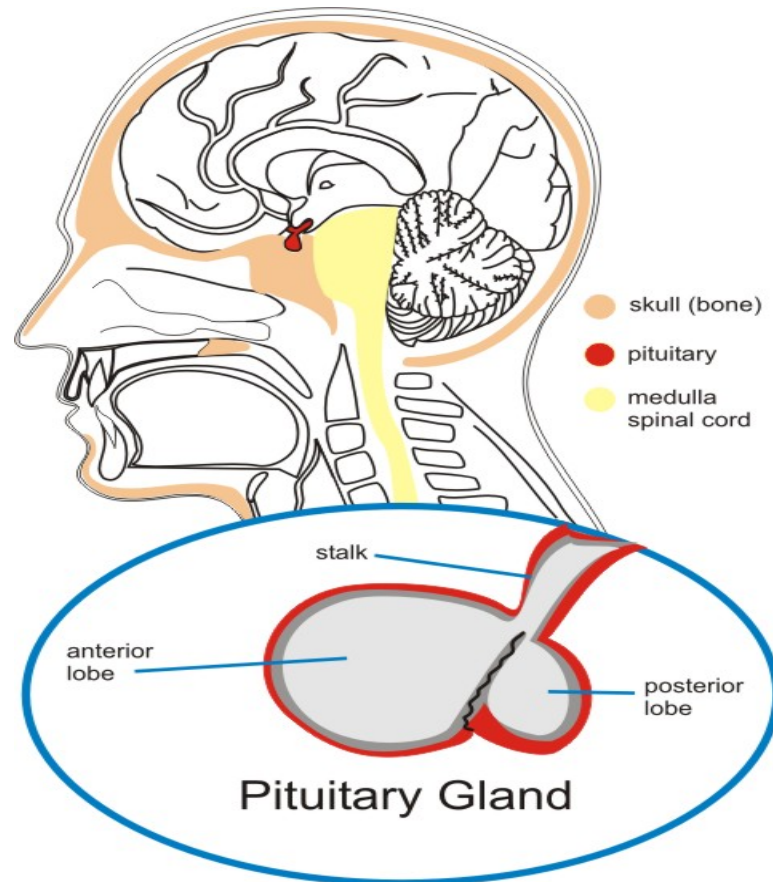
- Hormone-to set in motion

NEGATIVE FEEDBACK

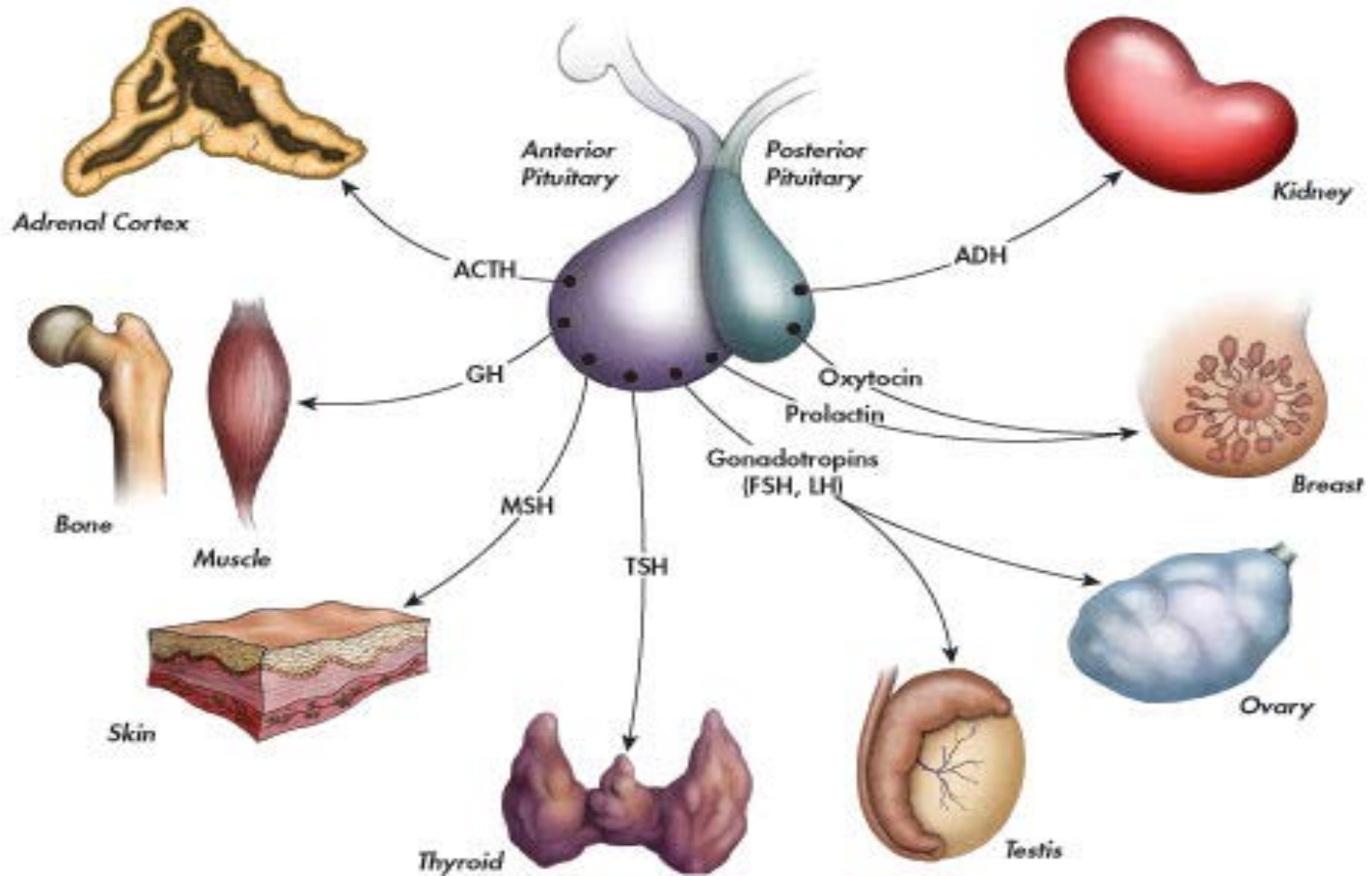


PITUITARY GLAND

- Hypophysis



PITUITARY GLAND



HORMONES OF THE ANTERIOR PITUITARY GLAND

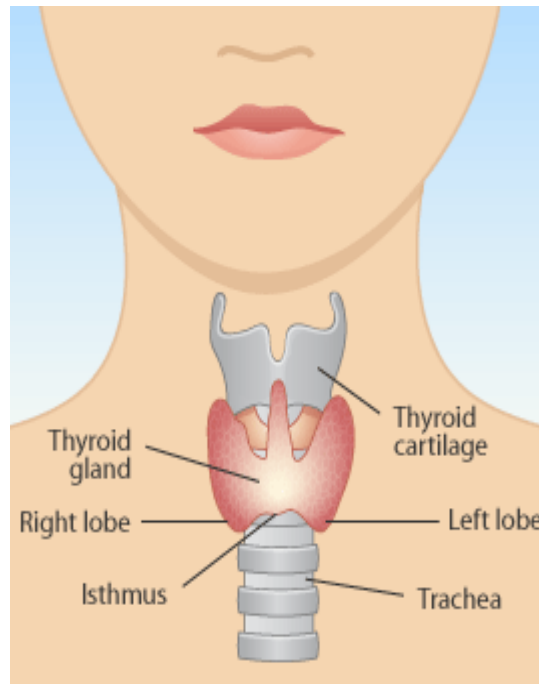
- Growth Hormone (GH)
- Thyroid Stimulating Hormone (TSH)
- Adrenocorticotrophic Hormone (ACTH)
- Follicle Stimulating Hormone (FSH)
- Luteinizing Hormone (LH)
- Prolactin
- Melanocyte Stimulating Hormone (MSH)

HORMONES OF THE POSTERIOR PITUITARY GLAND

- Oxytocin
- Antidiuretic Hormone (ADH)

THYROID GLAND

- 2 lobed gland, either side of trachea



HORMONES OF THE THYROID

- Thyroxine-T4
- Triiodothyronine-T3
 - Require iodine for synthesis; dietary sources
 - When T4, T3 low, pituitary produces TSH stimulating thyroid to produce more, leading to enlargement called goiter
- Calcitonin-released in response to high blood calcium levels

GOITER

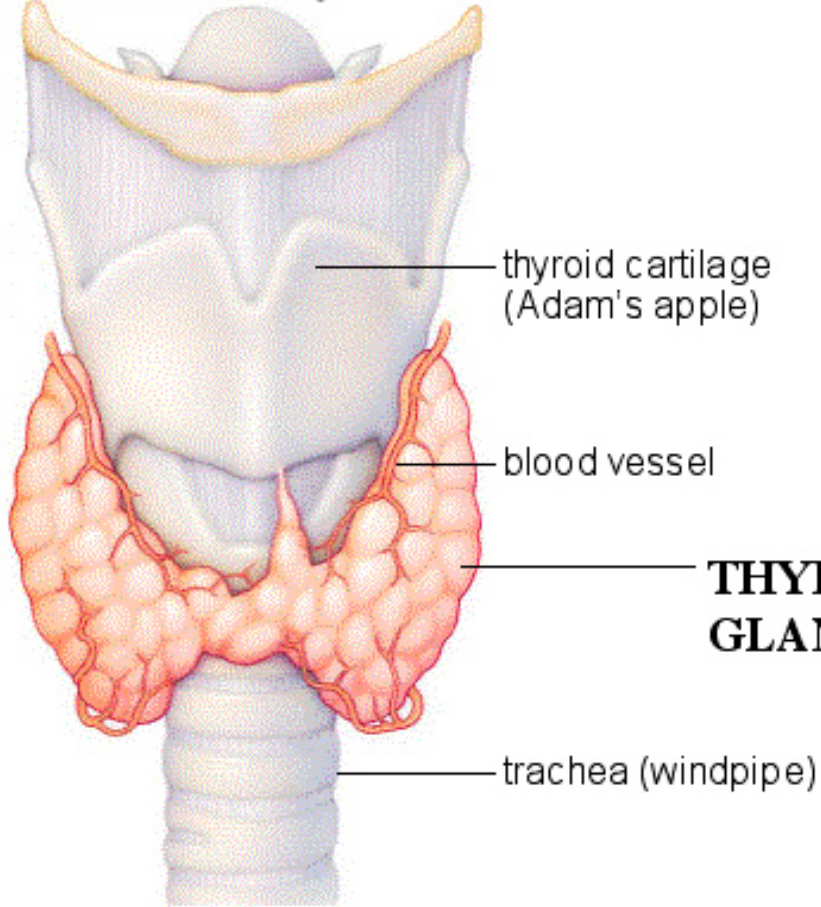


THYROID FUNCTIONS

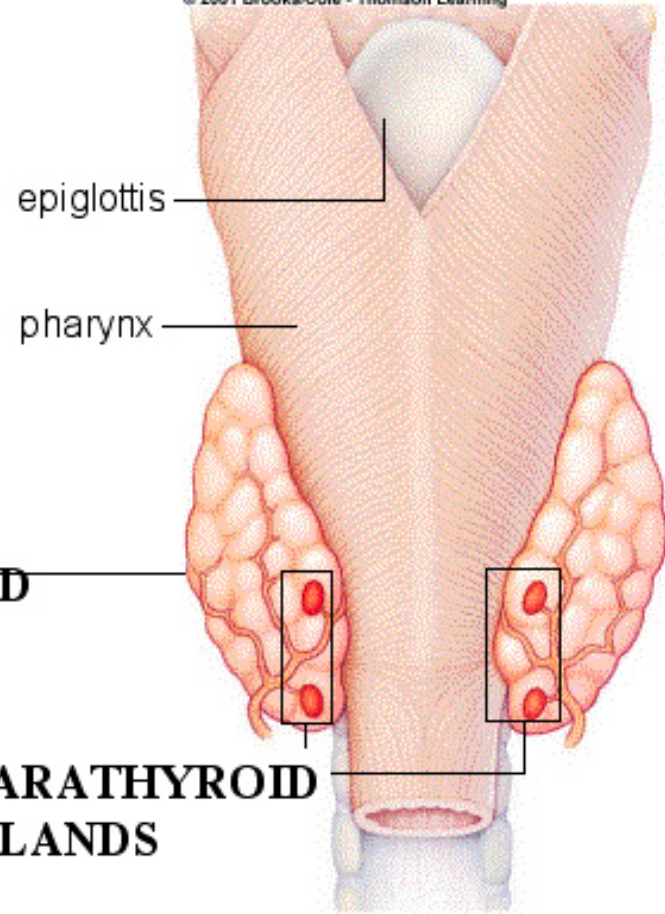
- Control metabolism
- Increasing rate of carbohydrate & protein metabolism
- Increasing body temperature
- Increasing heart rate
- Increasing reactivity of nervous system
- Regulating tissue growth & development

PARATHYROID GLANDS

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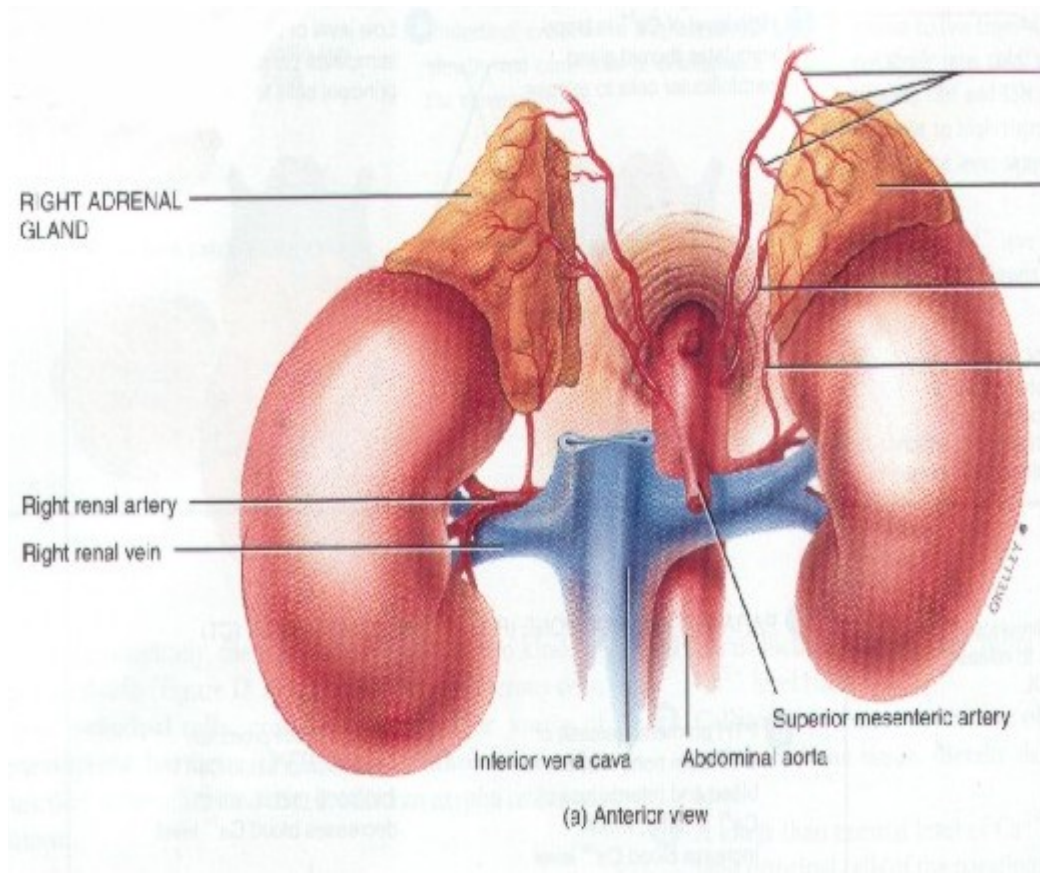
PARATHYROID GLANDS

- Also important in maintaining blood calcium levels
- PTH is released when blood Calcium levels are low; target cells for PTH are in the kidney and bone

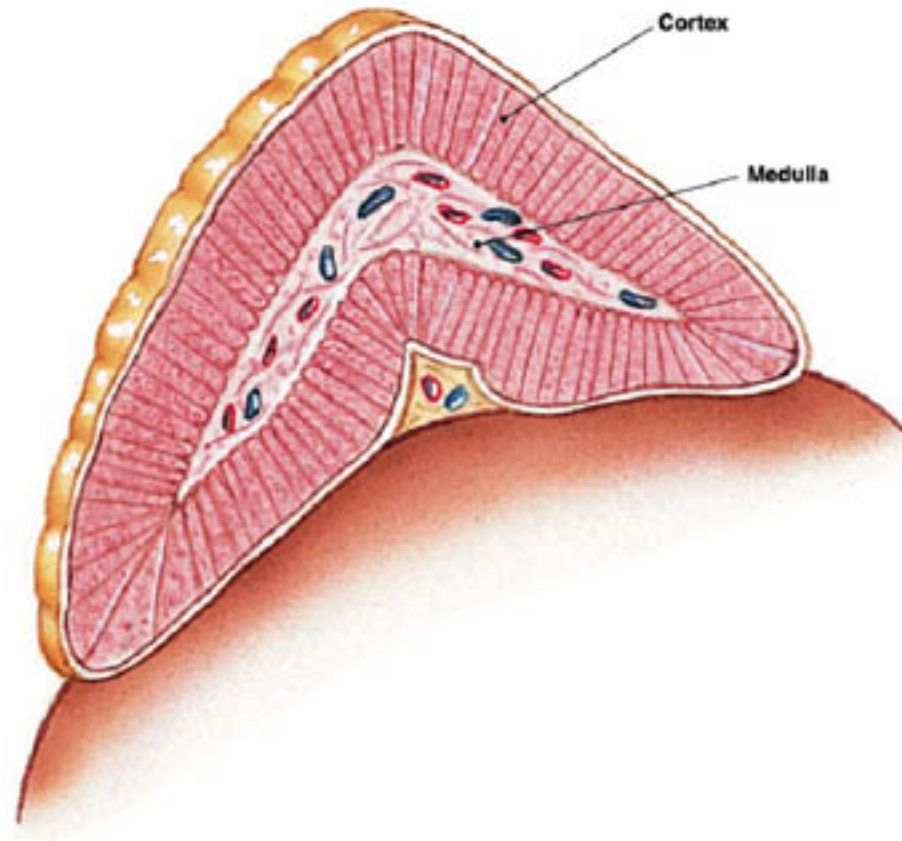
PARATHYROID GLANDS

- Hyperparathyroidism-usually caused by tumor or enlargement of one or more glands; Bone reabsorption of calcium (out) with increased blood levels, kidney stones, soft bones/ fractures/ osteoporosis
- Hypoparathyroidism-rare condition of abnormally low parathyroid hormone levels, with elevated phosphorus

ADRENAL GLANDS



ADRENAL GLAND



ADRENAL CORTEX

- Mineralocorticoids
- Glucocorticoids
- Gonadocorticoids

ADRENAL CORTEX

- Mineralocorticoids-**Aldosterone** is principle hormone and functions to conserve salt and water in the body. Target cells are in kidney
- Glucocorticoids-**Cortisol**(hydrocortisone) is principle hormone and functions to raise blood glucose which promotes normal metabolism and provides stress resistance

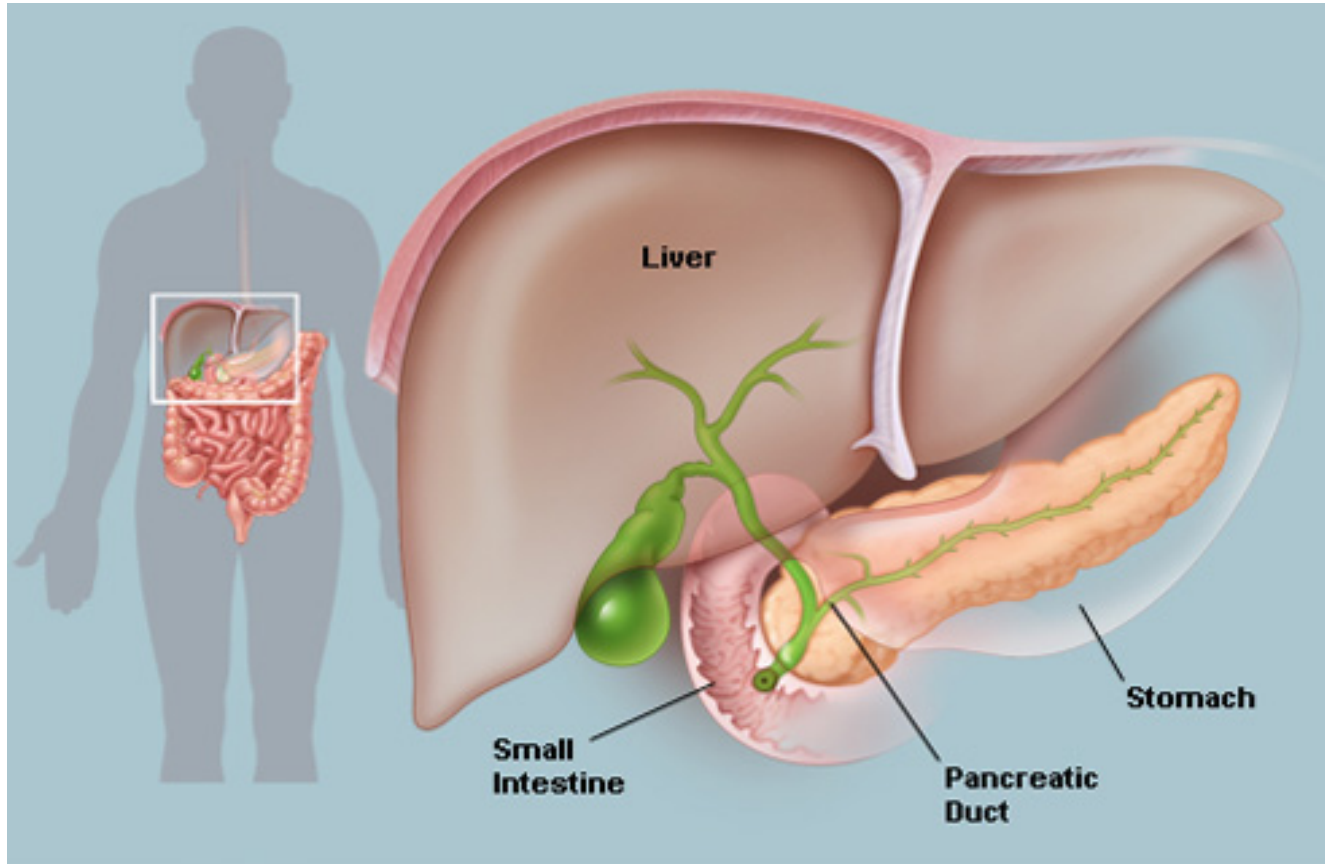
ADRENAL CORTEX

- Gonadocorticoids-**Androgens** in males and **estrogens** in females; effect of these hormones is usually overshadowed by release of these hormones from the testes and ovaries

ADRENAL MEDULLA

- Secrete epinephrine(adrenaline) and norepinephrine (noradrenaline)
- Response is increased heart and respiratory rate, increased blood pressure, increase in force of muscular contraction, increased blood sugar level
- Fight or flight response...or fright

PANCREAS



PANCREAS

- Head, body, tail sections
- Both an endocrine and exocrine gland
 - Endocrine-Islets of Langerhans are clusters of cells
 - Alpha cells-secrete glucagon (raises blood sugar)
 - Beta cells-secrete insulin (lowers blood sugar)
 - Exocrine-digestive enzymes

OVARIES



OVARIES

- Estrogen & progesterone
- Development of female reproductive organs
- Fat distribution in hips, legs, breasts
- Menstrual cycle
- Prepare uterus for pregnancy and maintain uterus during pregnancy
- Prepare mammary glands for lactation

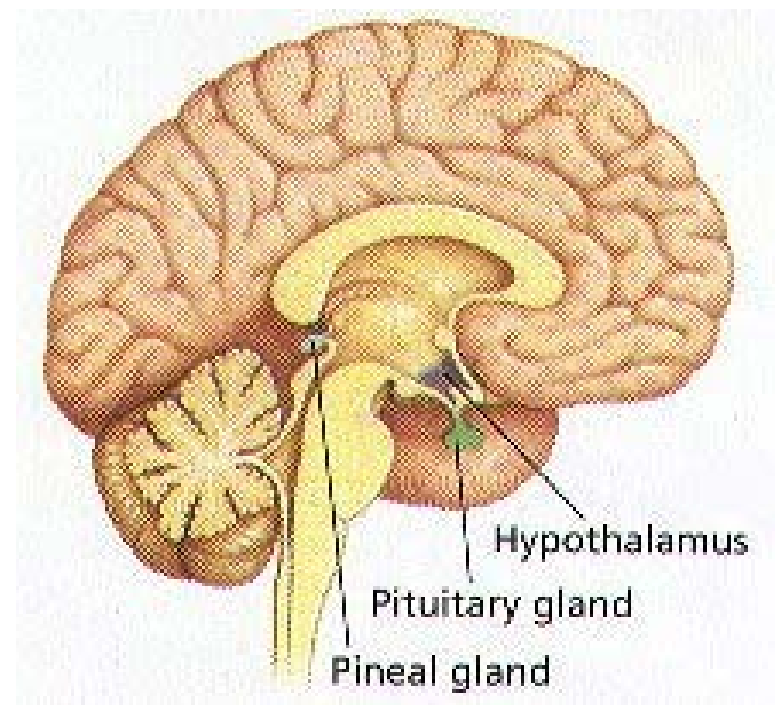
TESTES



TESTES

- Testosterone is primary male androgen
- Development of male reproductive structures
- Skeletal and muscular growth
- Enlargement of larynx; voice changes
- Male sex drive

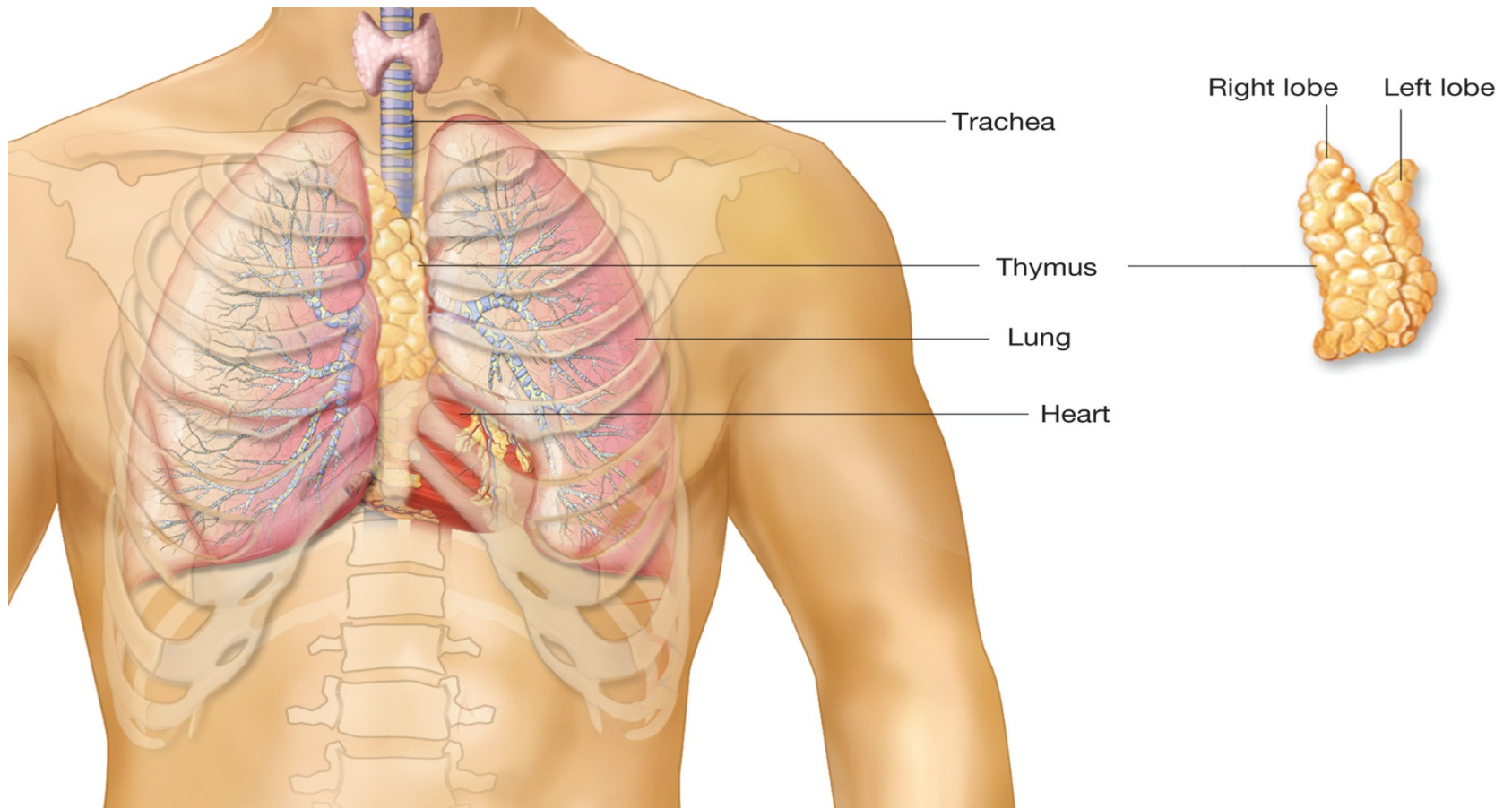
PINEAL GLAND



PINEAL GLAND

- Melatonin-maintain normal sleep-wake cycles and needed for reproductive development

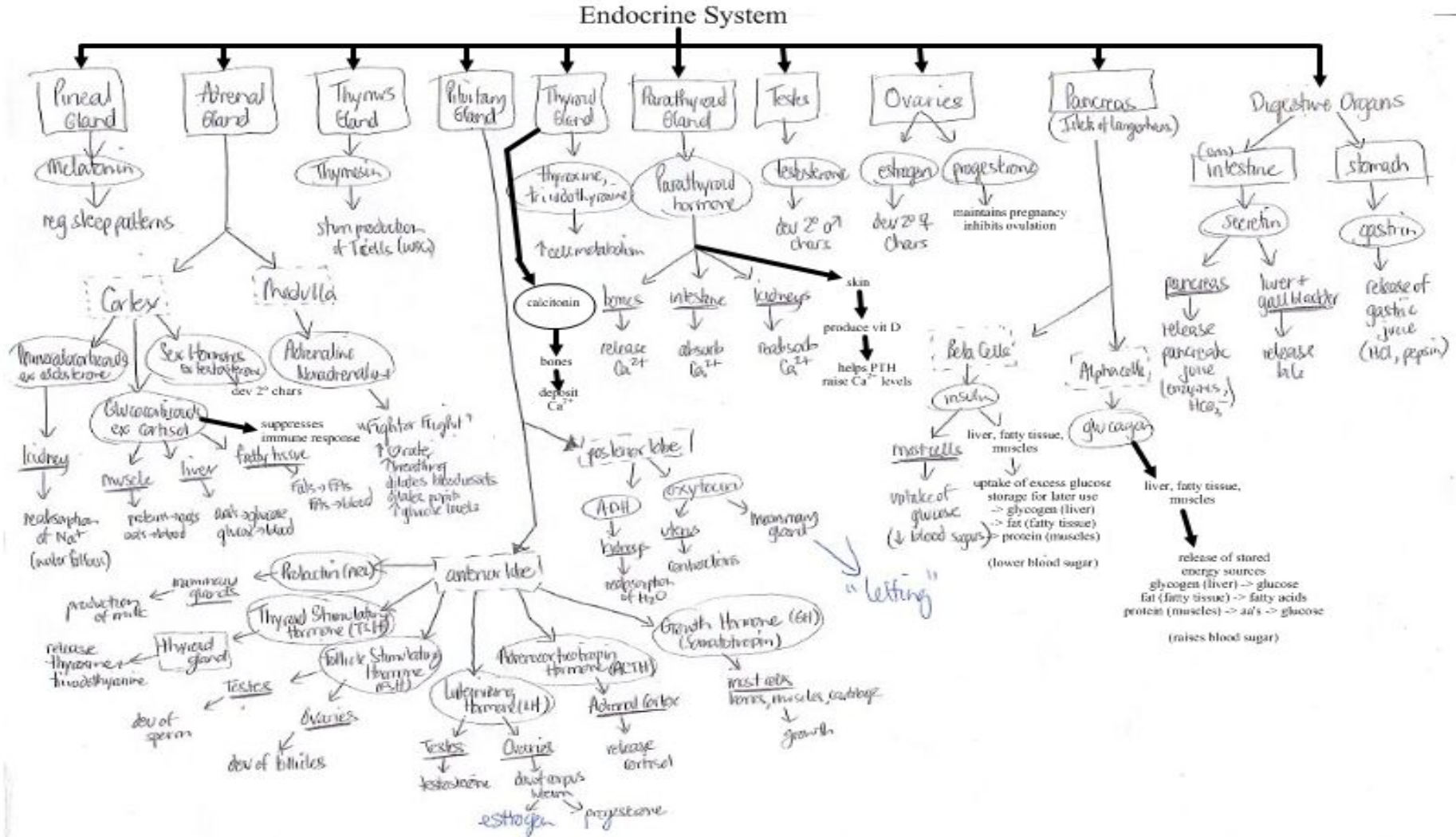
THYMUS



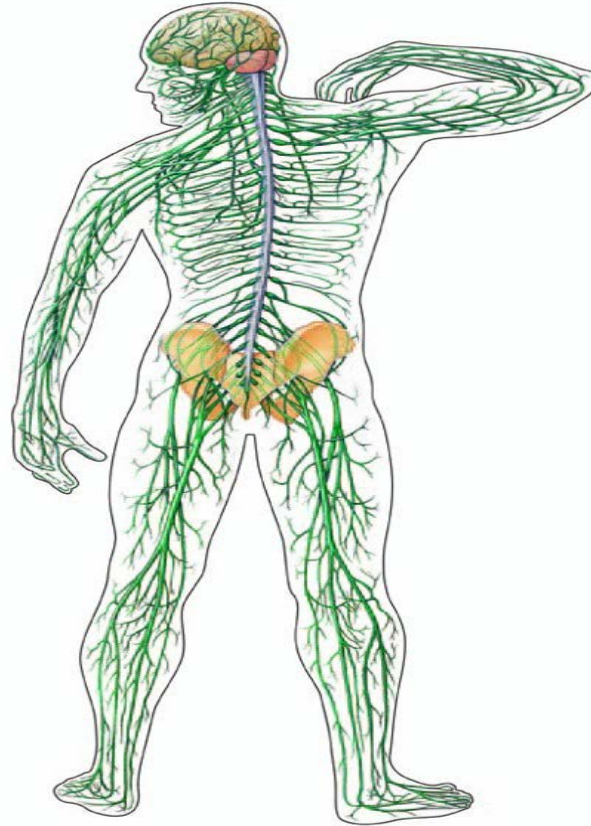
THYMUS

- Thymus-in mediastinum behind the sternum and between the lungs
- Lymphatic tissue-make T-lymphocytes that protect against infection
- Peak size at age 2; replaced by fat during puberty

IN SUMMARY...



NERVOUS SYSTEM

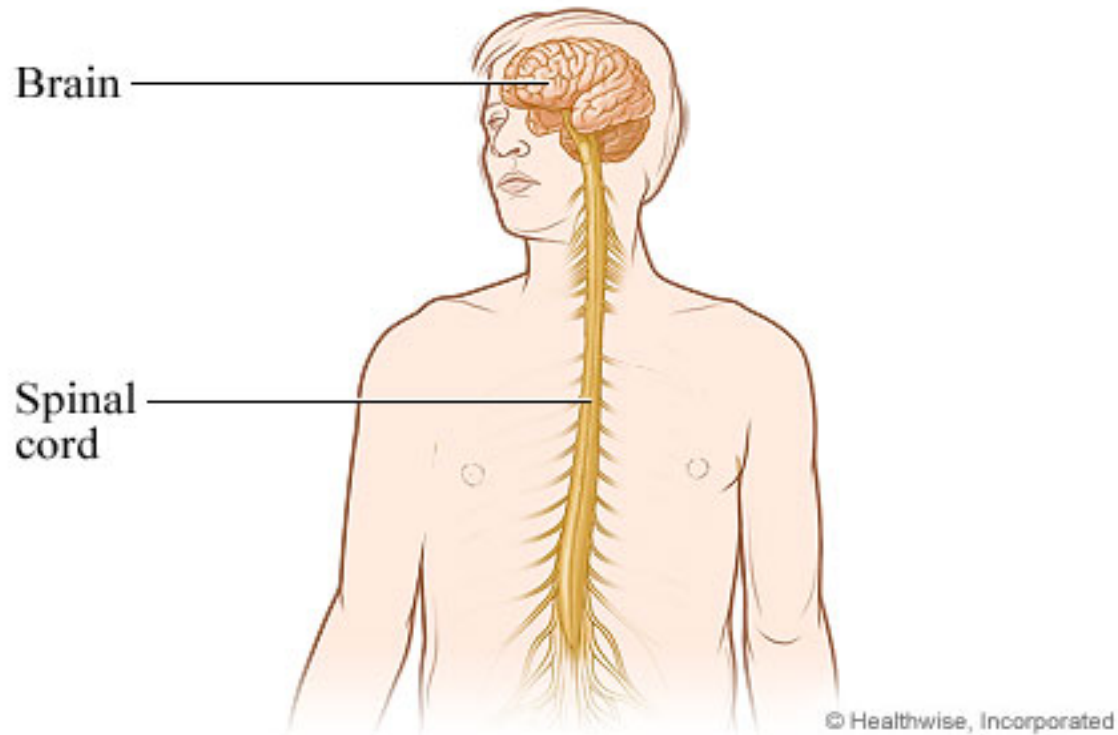


OVERVIEW

- Complex and sophisticated system that coordinates, communicates, and regulates body activities
- Senses changes both in our internal and external environment
- Electrical messages called nerve impulses are carried to and from central nervous system

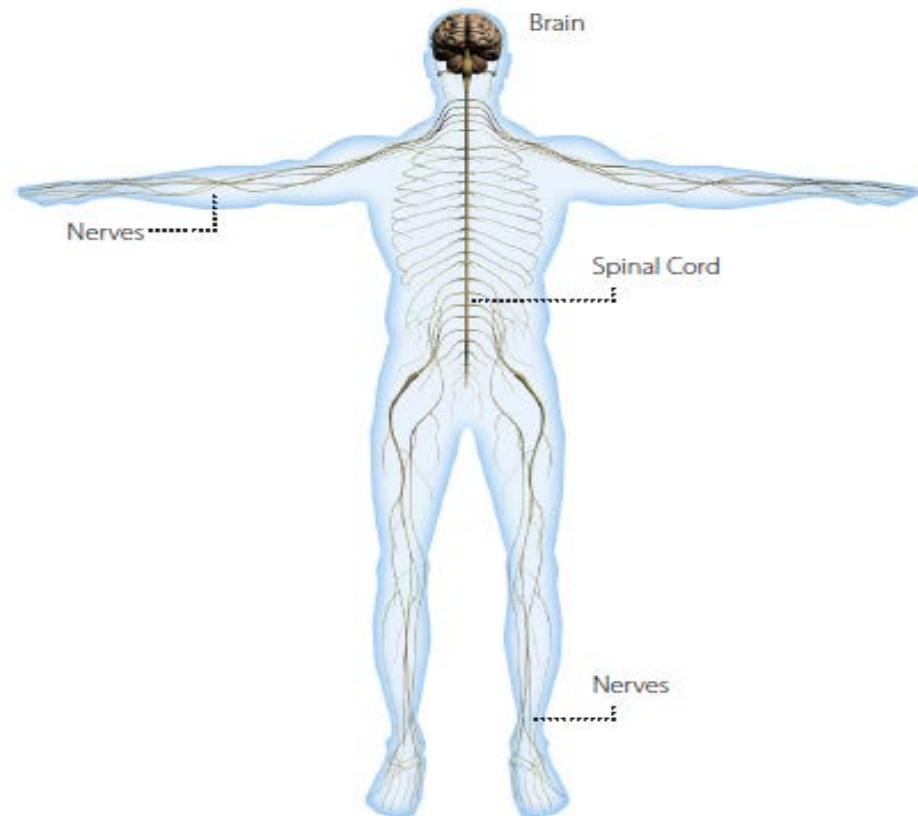
SUBDIVISIONS

- Central Nervous System (CNS)-brain and spinal cord

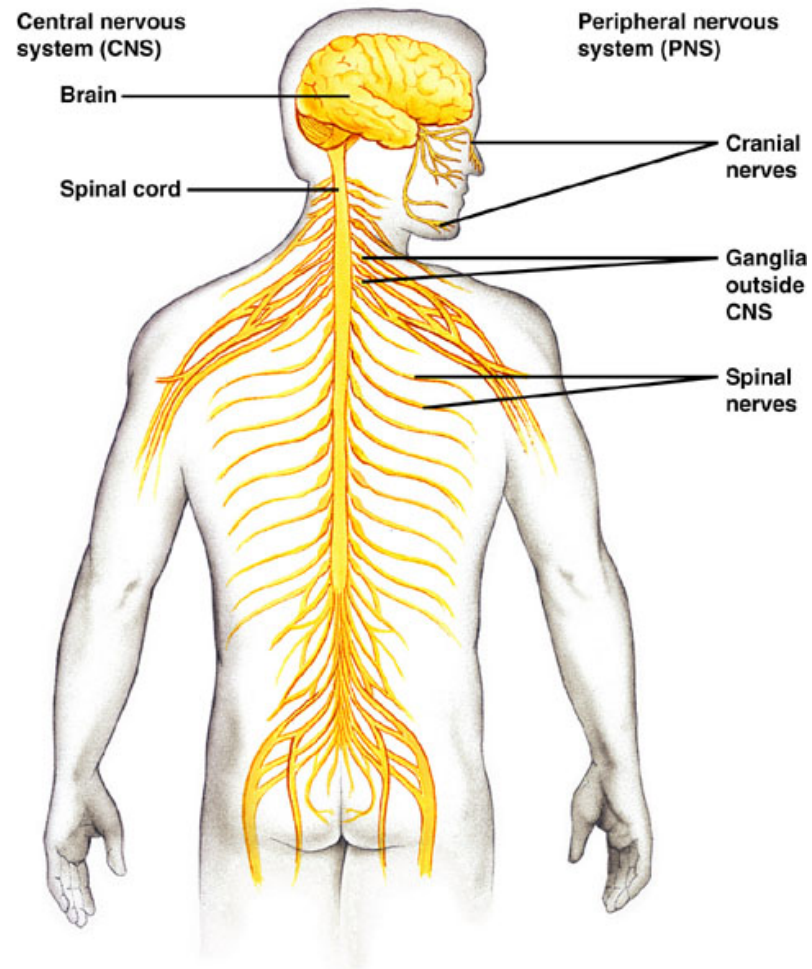


SUBDIVISIONS

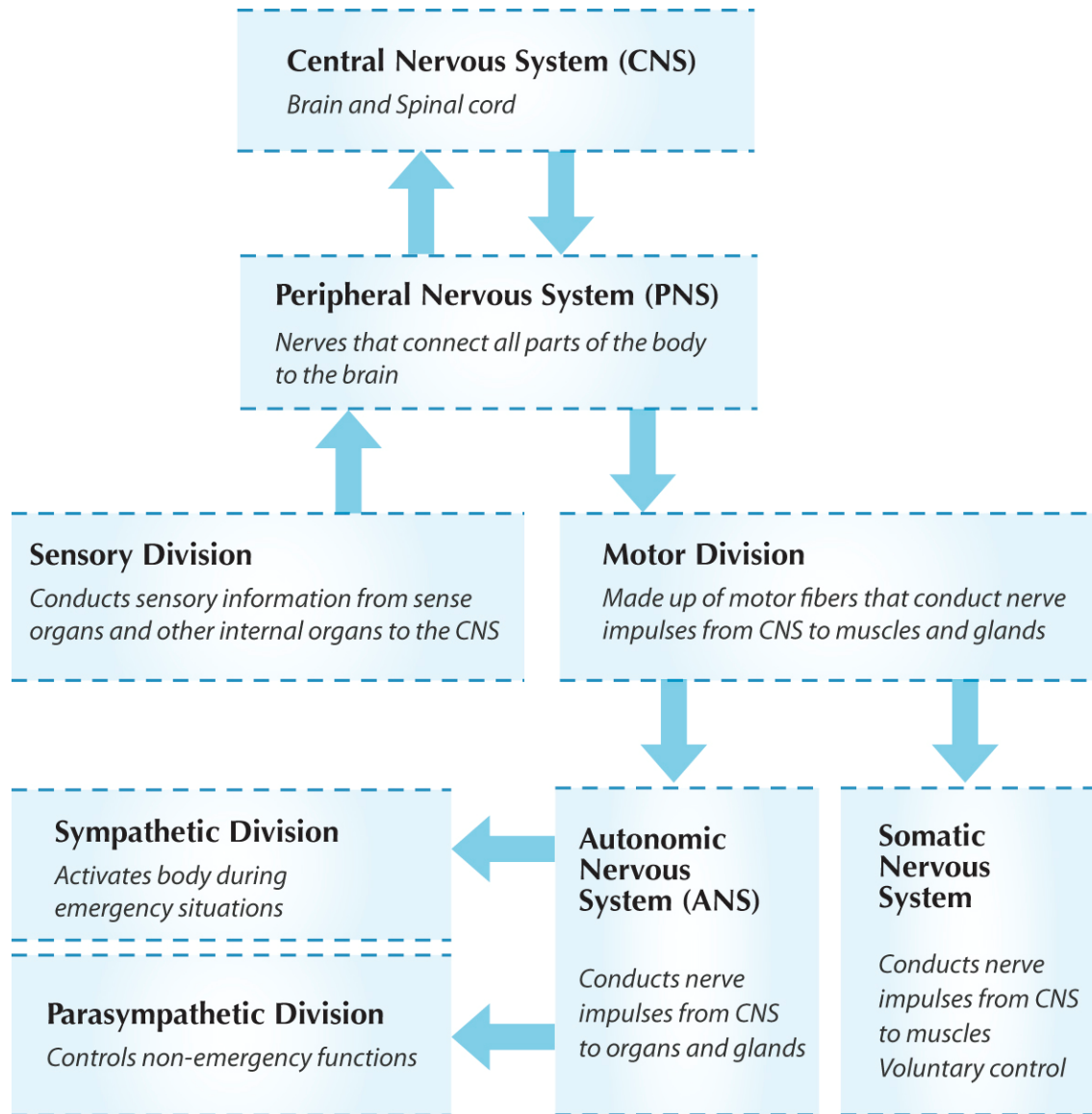
- Peripheral Nervous System (PNS)-consists of all other neural elements
 - Cranial nerves
 - Spinal nerves



NERVOUS SYSTEM



NERVOUS SYSTEM



PNS SUBDIVISIONS

- **Afferent (sensory)** neurons carry impulses from peripheral body to the brain and spinal cord
- **Efferent (motor)** neurons carry impulses from the brain and spinal cord to muscles and glands

PNS SUBDIVISIONS

- Efferent subdivided into
 - **Somatic nervous system (voluntary)**
Fibers connect CNS with *skeletal muscle & skin*
 - **Autonomic nervous system (automatic)**
Fibers connect CNS with *cardiac muscle, smooth muscle, organs & glands*

AUTONOMIC NERVOUS SYSTEM

- Major component of maintaining body homeostasis
 - **Sympathetic Division**-response to stress, anxiety, fear, excitement-"fight or flight response" done by increasing *norepinephrine* and epinephrine secretion from adrenal gland resulting in increased heart rate, blood pressure, respiration

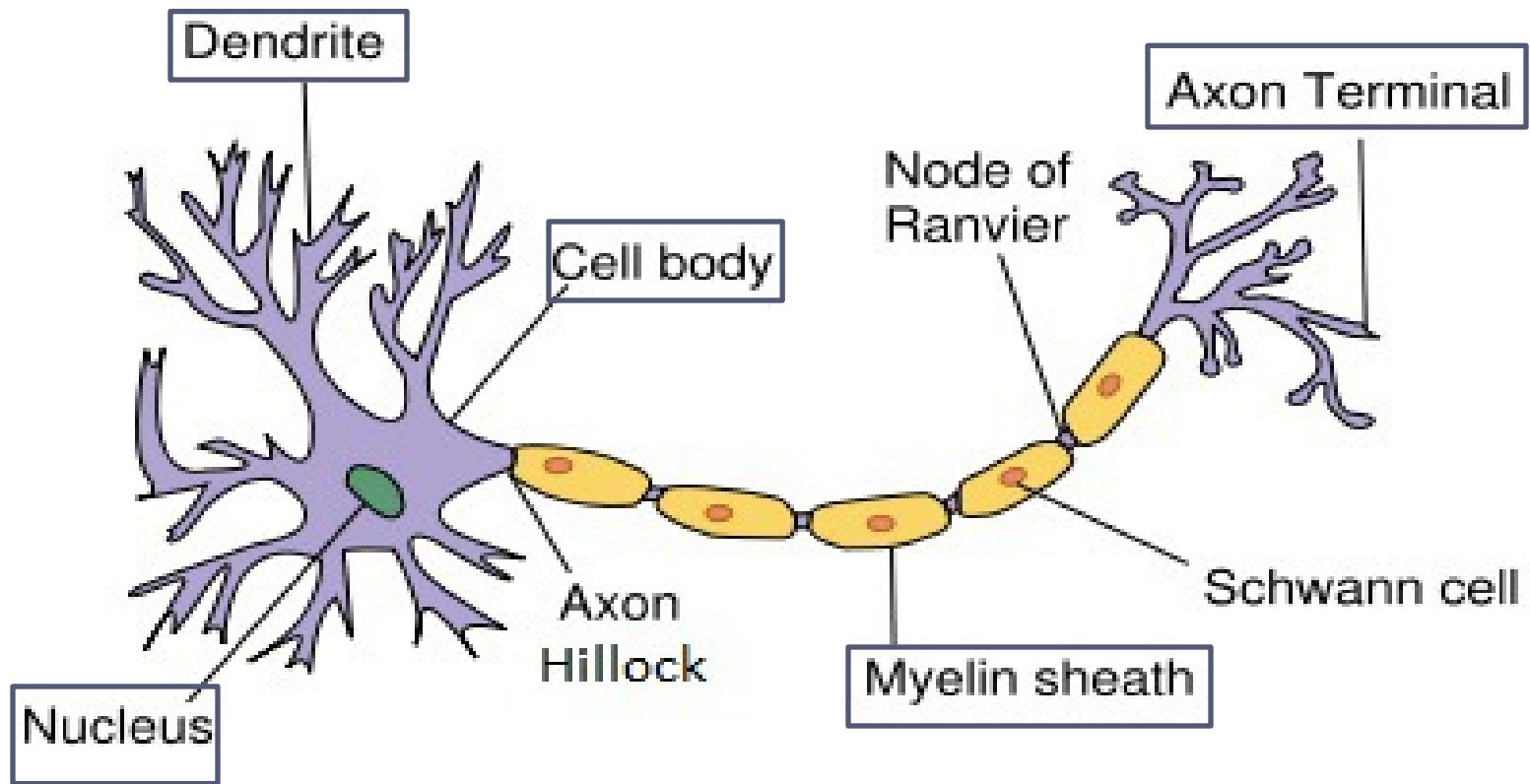
AUTONOMIC NERVOUS SYSTEM

- **Parasympathetic Division-** "rest and digest system"; conserves energy as it slows heart rate, stimulates digestion; dilates blood vessels; relaxes sphincter muscles in the GI tract

CELL TYPES

- Neurons-generate and conduct impulses from one part of body to another
- Neuroglia-also called glial cells-form connective tissue of nervous system; non-conductive tissue that supports and insulates nervous tissue

NEURON

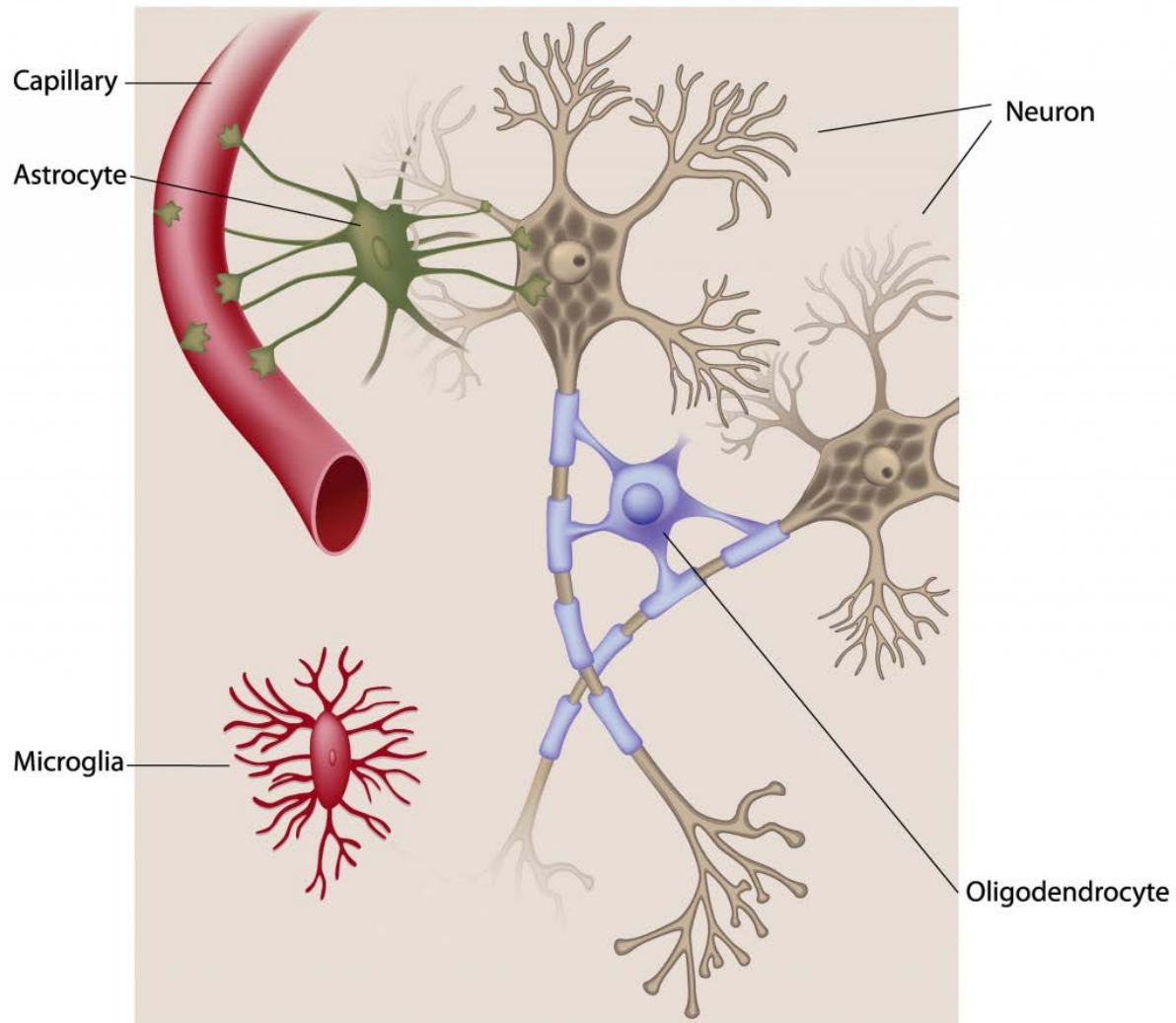


CNS GLIAL CELLS

- Astrocytes
- Oligodendrocytes
- Ependymal cells
- Microglia

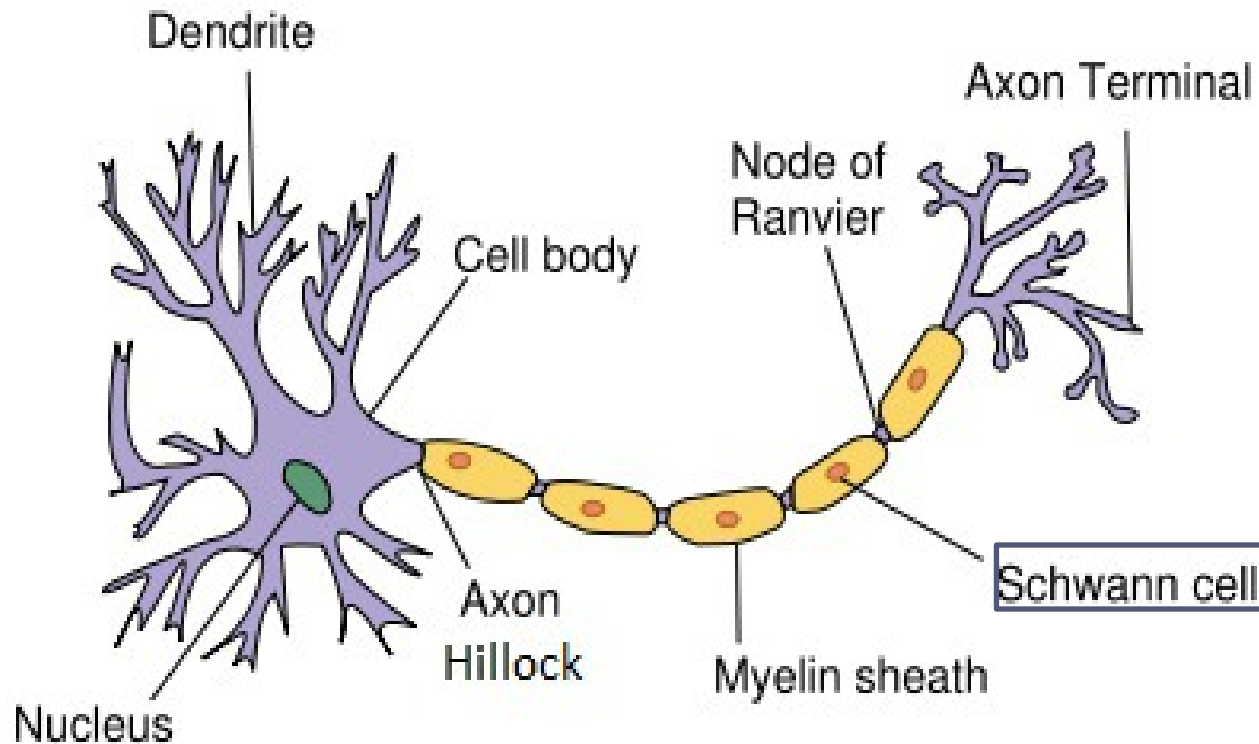
NEUROGLIA

Cells of the Central Nervous System

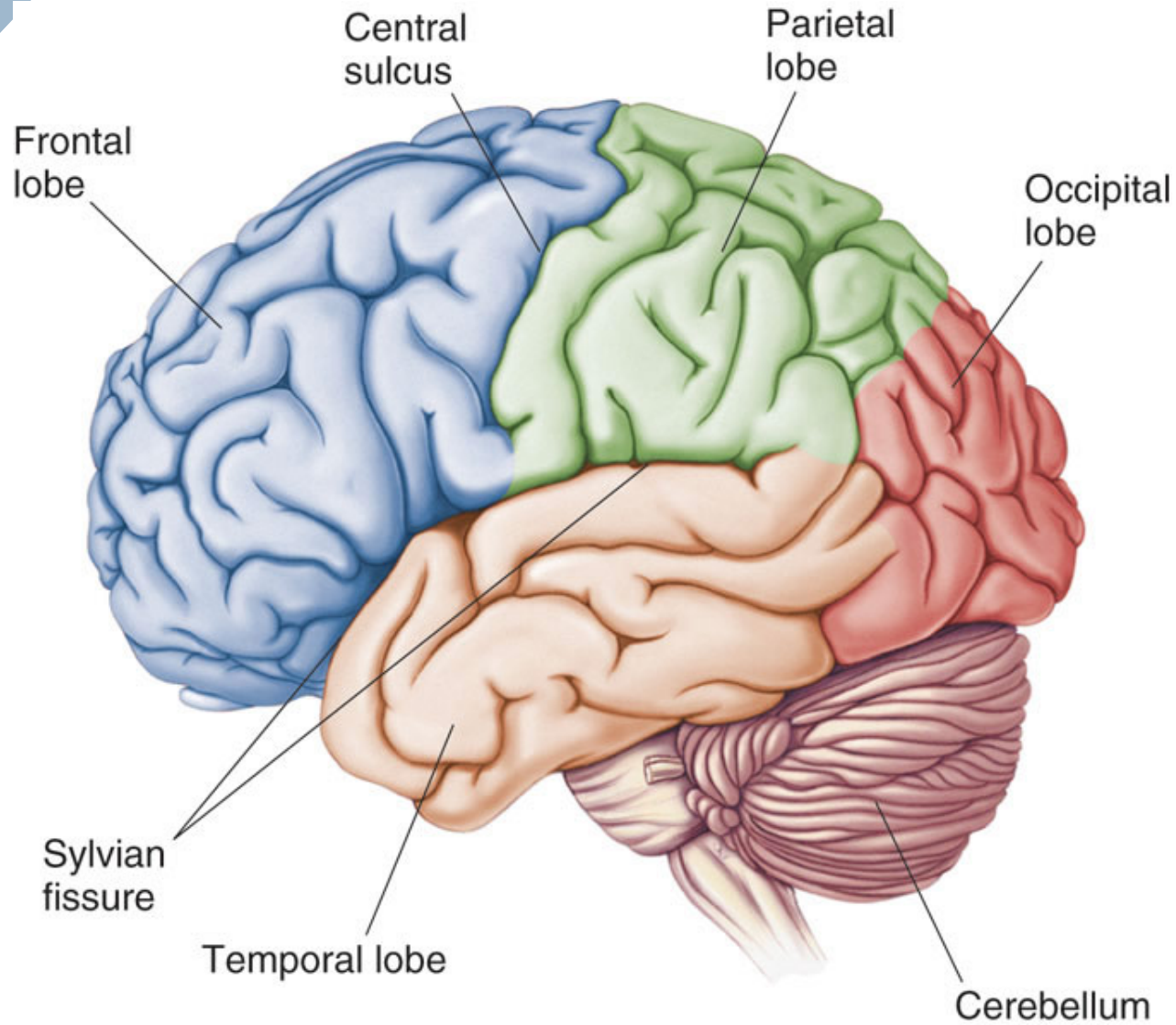


PNS GLIAL CELLS

Schwann Cell



BRAIN ANATOMY





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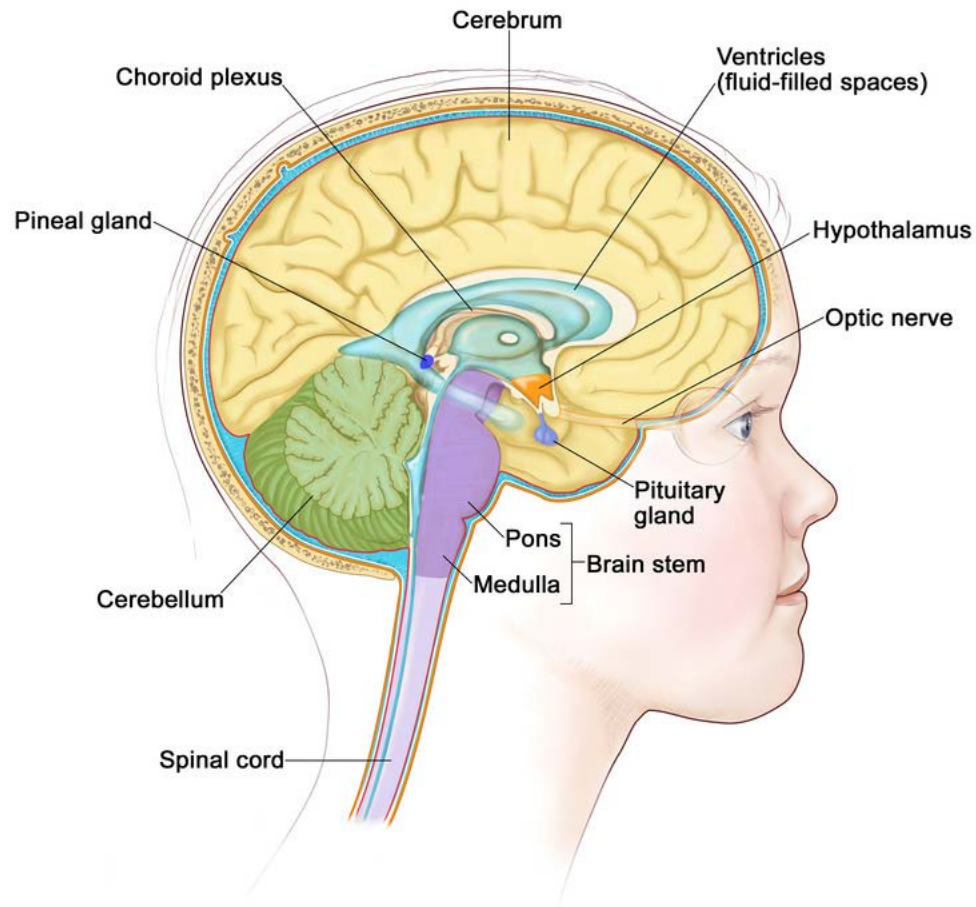
CEREBRUM FUNCTIONS

- 1. Motor functions-muscle movement
- 2. Sensory functions-interpret sensory input
- 3. Association functions-emotional and intellectual processes

CEREBELLUM FUNCTIONS

- Controls unconscious movements in skeletal muscle
- Coordination, posture, balance

BRAIN STEM



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MEDULLA OBLONGATA

- Conduction of nerve impulses between the spinal cord and brain
- Origination of 4 pairs of cranial nerves (IX, X, XI, XII)
- Three vital reflex centers: cardiac, respiratory and vasoconstrictor centers

PONS

- Pons means “bridge”
- Between the spinal cord and brain
- Four cranial nerves originate here: V, VI, VII, VIII

MIDBRAIN

- Mesencephalon
- Connects pons and the cerebellum
- Two cranial nerves originate here: III, IV

THALAMUS

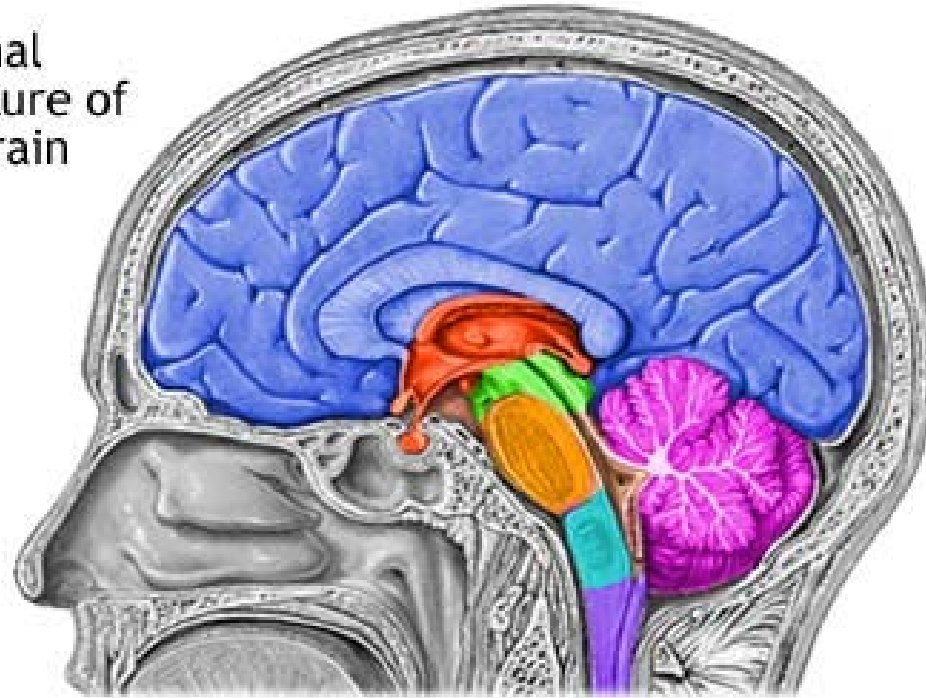
- Relay sensory impulses (except smell) to the cerebral cortex
- Recognize and interpret pain

HYPOTHALAMUS

- Heartbeat, urinary bladder contraction, movement of food through digestive tract
- Control Body temperature
- Responds to changes in mental state by initiating changes in HR, RR, etc.
- Stimulate hunger, satiety, thirst sensations
- Regulate sleep/wake cycles
- Work with endocrine system-homeostasis

BRAIN ANATOMY

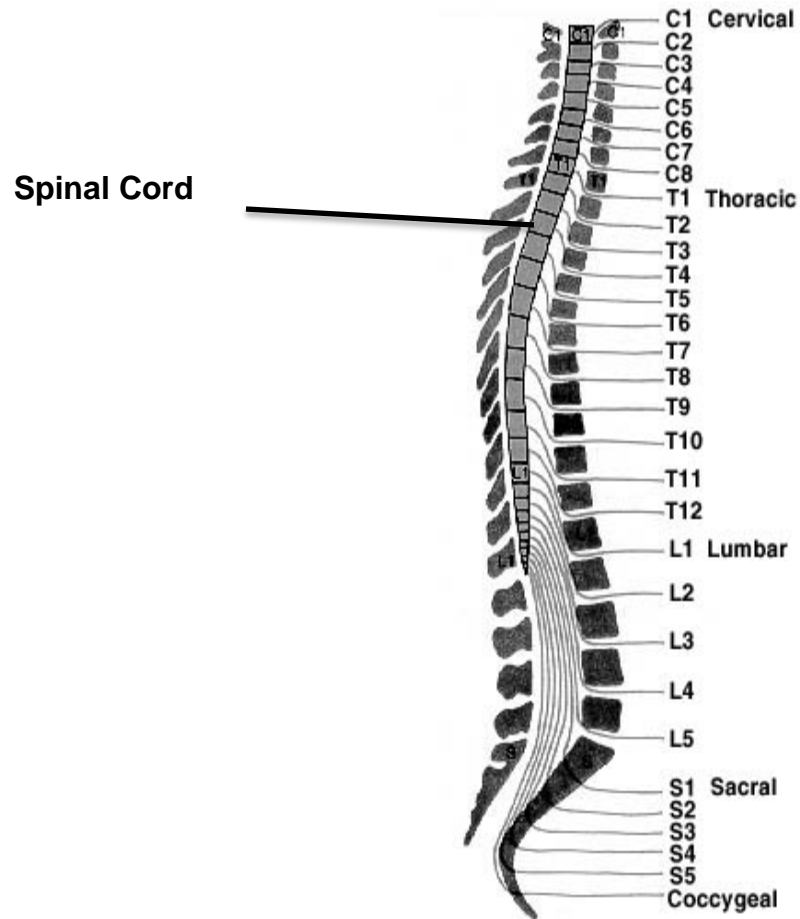
Internal
structure of
the brain



- | | | | |
|-------------------|------------|---------------------|------|
| Spinal cord | Cerebellum | Diencephalon | Pons |
| Medulla Oblongata | Midbrain | Cerebral hemisphere | |

 ADAM.

SPINAL CORD

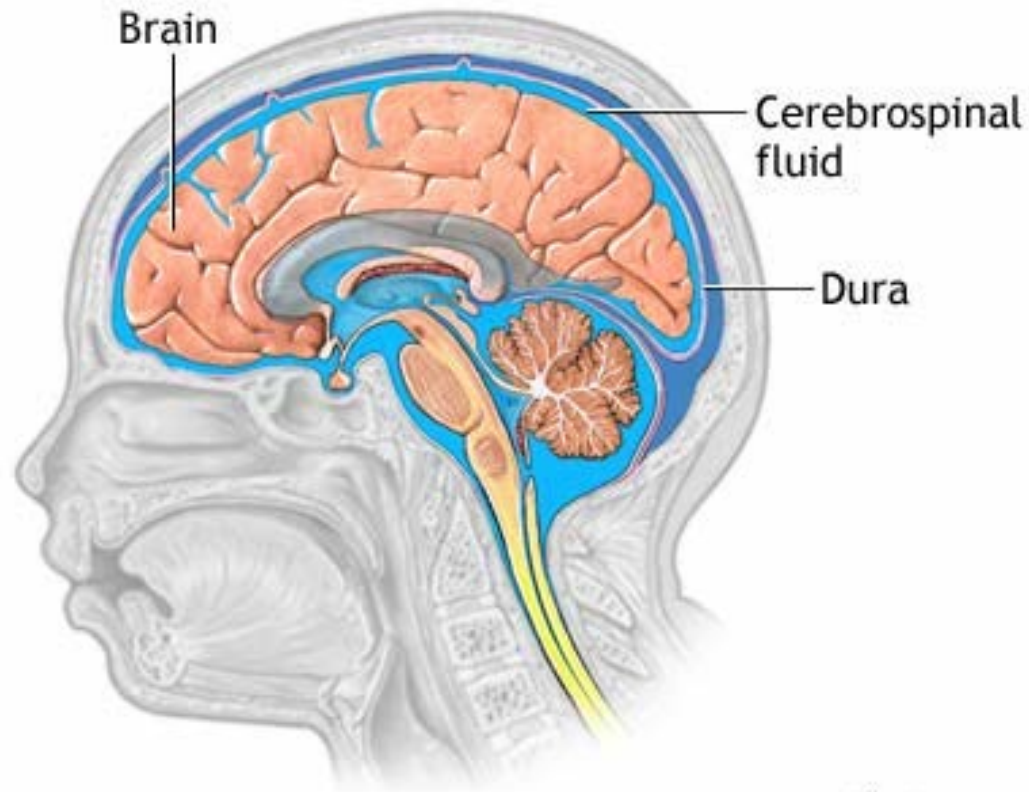


MENINGES

- Dura mater (tough mother)
- Arachnoid
- Pia mater (delicate mother)

- Membranes cover and protect brain and spinal cords

CEREBROSPINAL FLUID (CSF)



ADAM.

SIGNS, SYMPTOMS, ABNORMAL FINDINGS

- General
 - Disorientation, stupor, drowsiness
 - Vertigo
 - Speech disturbance
 - Convulsions

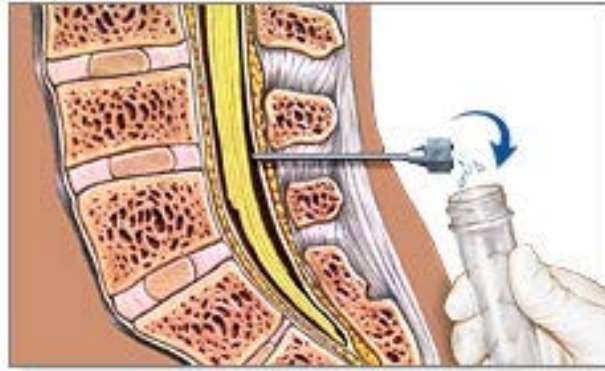
SIGNS, SYMPTOMS, ABNORMAL FINDINGS

- Specific to Nervous System
 - Abnormalities of gait and movement
 - Abnormalities of involuntary movements
 - Abnormal reflexes
 - Lack of coordination
 - Transient/permanent paralysis

DIAGNOSTIC TESTS

- Blood, urine, CSF
- EEG, EMG, PET
- CT/MRI

LUMBAR PUNCTURE



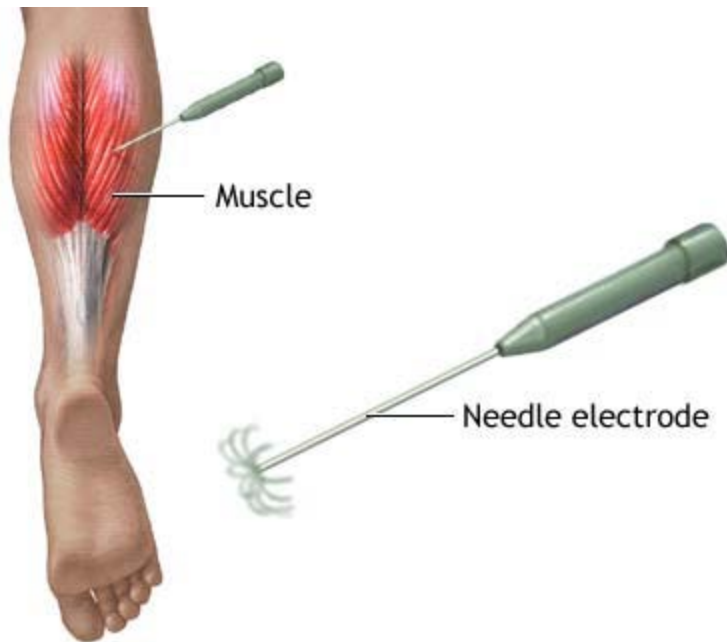
Spinal fluid
is collected
for testing



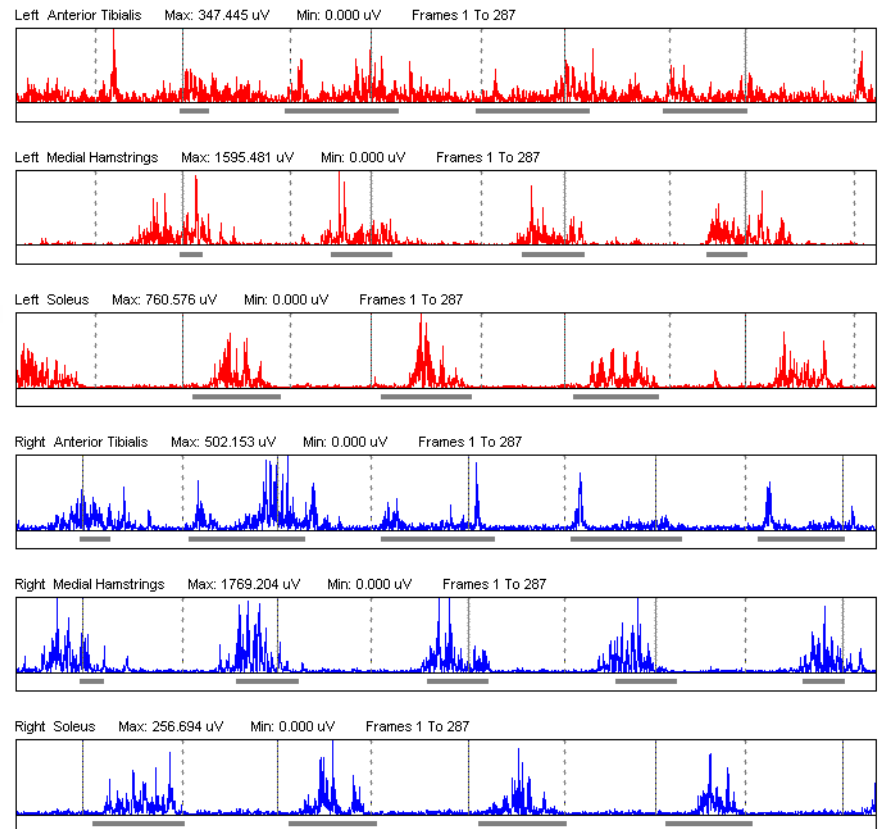
EEG



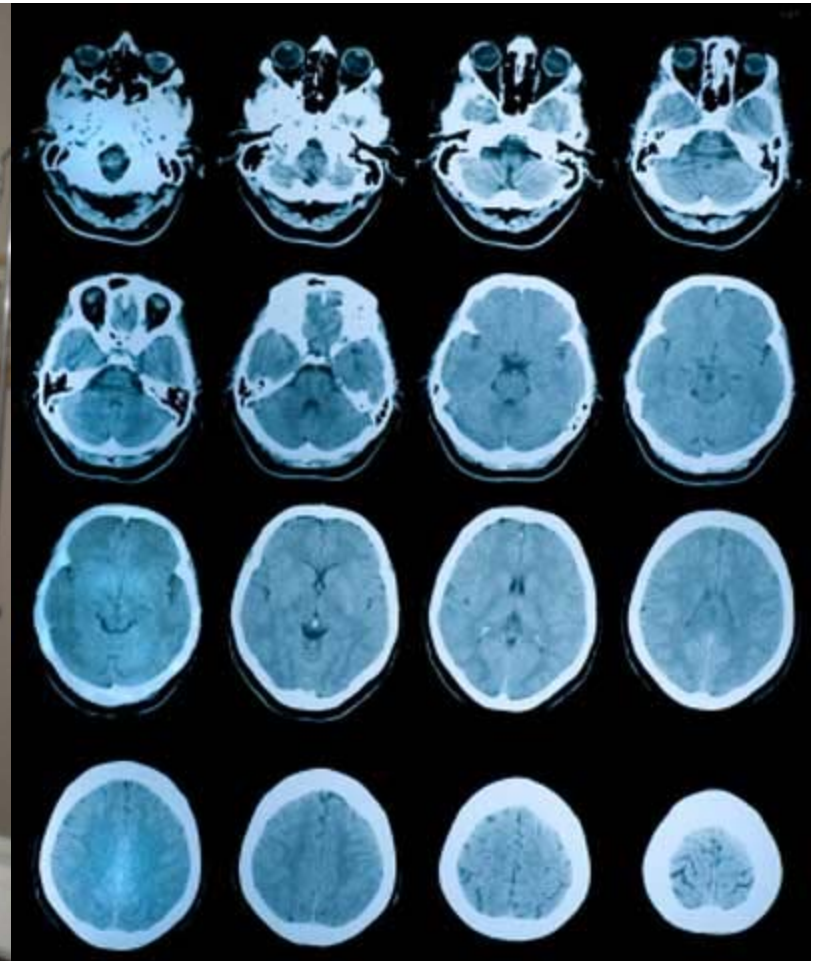
EMG



TRIAL VIEW



CT SCAN



MRI



CRANIAL NERVES

Nerve

I. Olfactory

II. Optic

III. Oculomotor

IV. Trochlear

V. Trigeminal

VI. Abducens

VII. Facial

VIII. Vestibulocochlear

IX. Glossopharyngeal

X. Vagus

XI. Accessory

XII. Hypoglossal

Function

Smell

Vision

Eye movement, pupil constriction

Eye movement

Touch, pain from the face and head;
muscles for chewing.

Eye movement

Taste, facial expressions

Balance and hearing

Taste and swallowing

Glands, digestion, heart rate

Head and shoulder movement.

Muscles of tongue

OPHTHALMIC SYSTEM



BAKER|NEWMAN|NOYES

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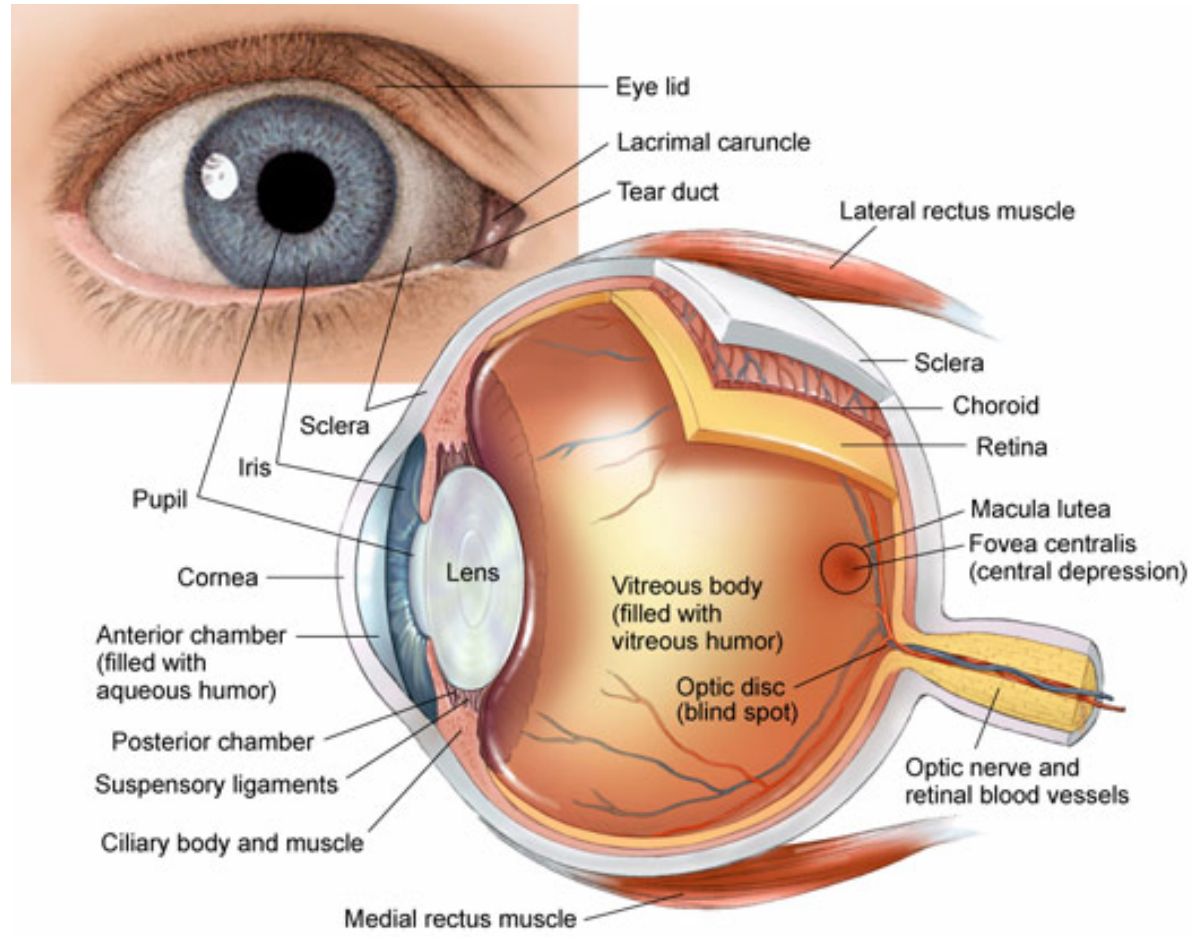
FOR PRESENTATION PURPOSES ONLY

EYE

- Most complex of sense organs
- Vision occurs when light interacts with special cells in the eyes, sending electrical impulses to the visual center
- Also performs color differentiation and depth perception

- Accessory structures include the eyebrows, eyelids, extraocular muscles, and lacrimal glands

EYE



Right Eye (viewed from above)

- Conjunctiva
 - Clear membrane covering the sclera and inside of eyelids
 - Lubricates and prevents foreign bodies from penetrating deeper into the eye

ANTERIOR SEGMENT

- Sclera
 - White part of eye
 - Protective layer and maintains the shape of the globe (eyeball, bulbus oculi)
 - Provides attachment for extraocular muscles (EOM)
- Cornea
 - Transparent fibrous coat covering the front of eye
 - Works with lens to refract light to focus on the retina

ANTERIOR SEGMENT

- Anterior chamber
 - Space between iris and cornea
 - Filled with aqueous humor
- Iris
 - Colored part of eye
 - Controls size and diameter of the pupil and the amount of light reaching the retina
 - Divides anterior and posterior chamber

ANTERIOR SEGMENT

- Lens
 - Transparent structure, along with cornea, helps to refract light to be focused on the retina
 - Changes shape (flattened vs. spherical) enabling eye to adjust focus between near and far objects (accommodation)

ANTERIOR SEGMENT

- Ciliary Body
 - Smooth muscle which controls accommodation
- Posterior chamber
 - Space behind the iris and in front of the lens
 - Stores aqueous humor and eventually transported to anterior chamber

POSTERIOR SEGMENT

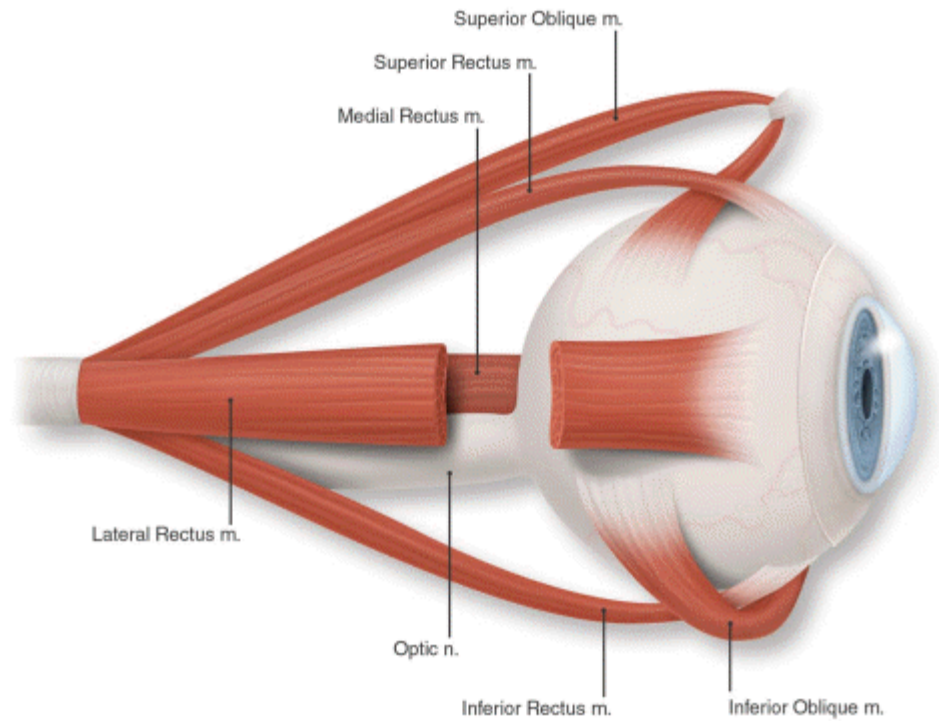
- Vitreous Body (Vitreous humor)
 - Transparent, colorless gel that fills space between lens and retina
- Retina
 - Light sensitive tissue lining covering back surface of eye
 - Rods/Cones
 - Rods-light sensitive; support vision when light is low
 - Cones-color perception and visual acuity

POSTERIOR SEGMENT

- Choroid-vascular layer providing oxygen and other nutrients to the outer layers of the retina
- Posterior sclera

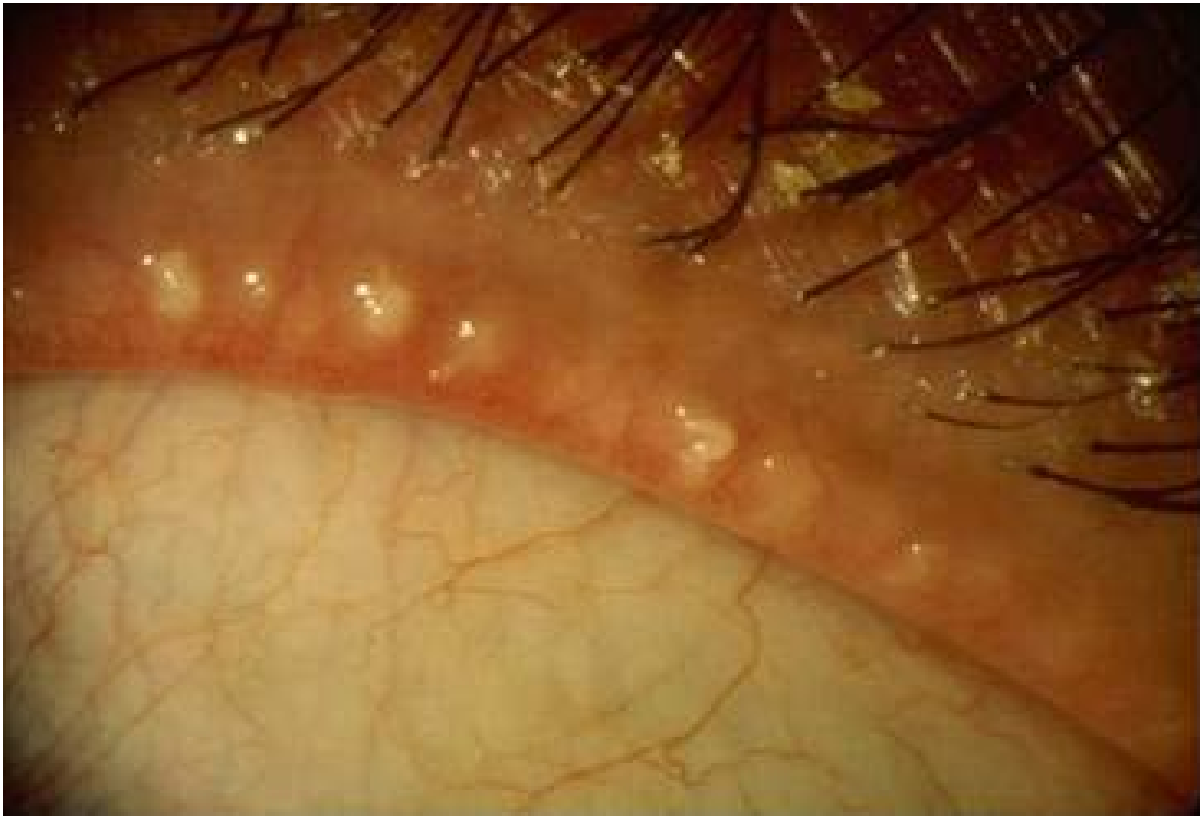
- Extraocular Muscles
- Medial rectus
 - Inward towards nose-adduction
- Lateral rectus
 - Outward away from nose-abduction
- Superior rectus
 - Upward/elevation-adduction
- Inferior rectus
 - Downward/depression- adduction
- Superior oblique
 - Downward/depression-abduction
- Inferior oblique
 - Upward/elevation-abduction

EXTRAOCULAR MUSCLES

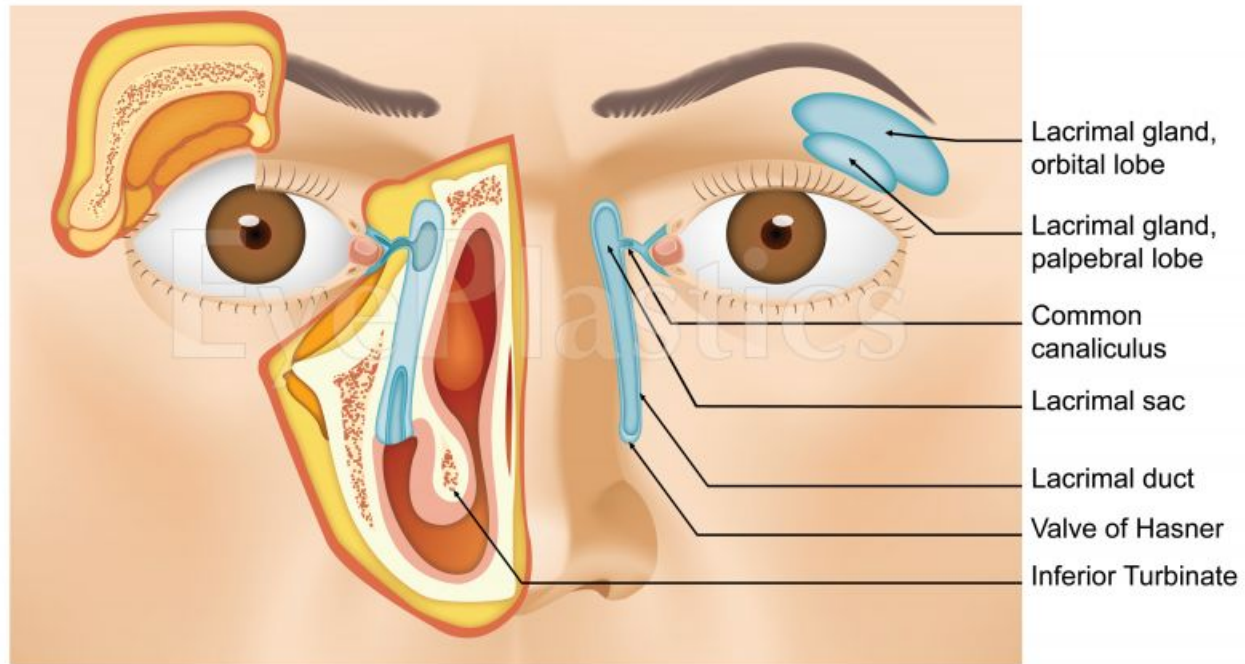


- Eyelid-protect eye from foreign material and spreads tears to keep eye surface moist
- Levator palpebrae muscle
- Meibomian glands
- Ciliary glands (glands of Zeis and Moll)

MEIBOMIAN GLANDS



- Lacrimal System



- Orbit-socket containing the eyeball
- Optic Nerve (CNII)-transmits visual information from the retina to the brain

AUDITORY SYSTEM

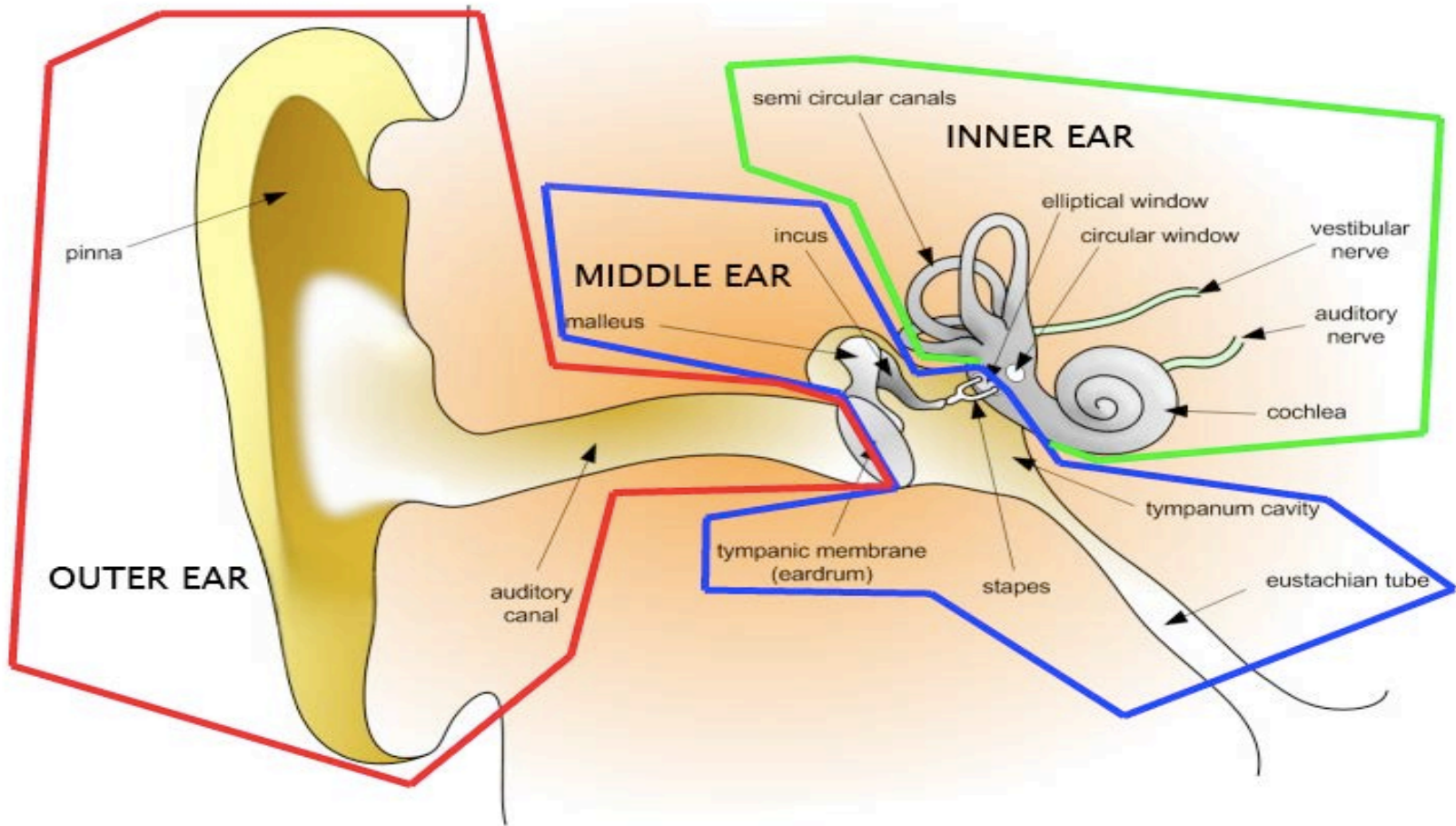


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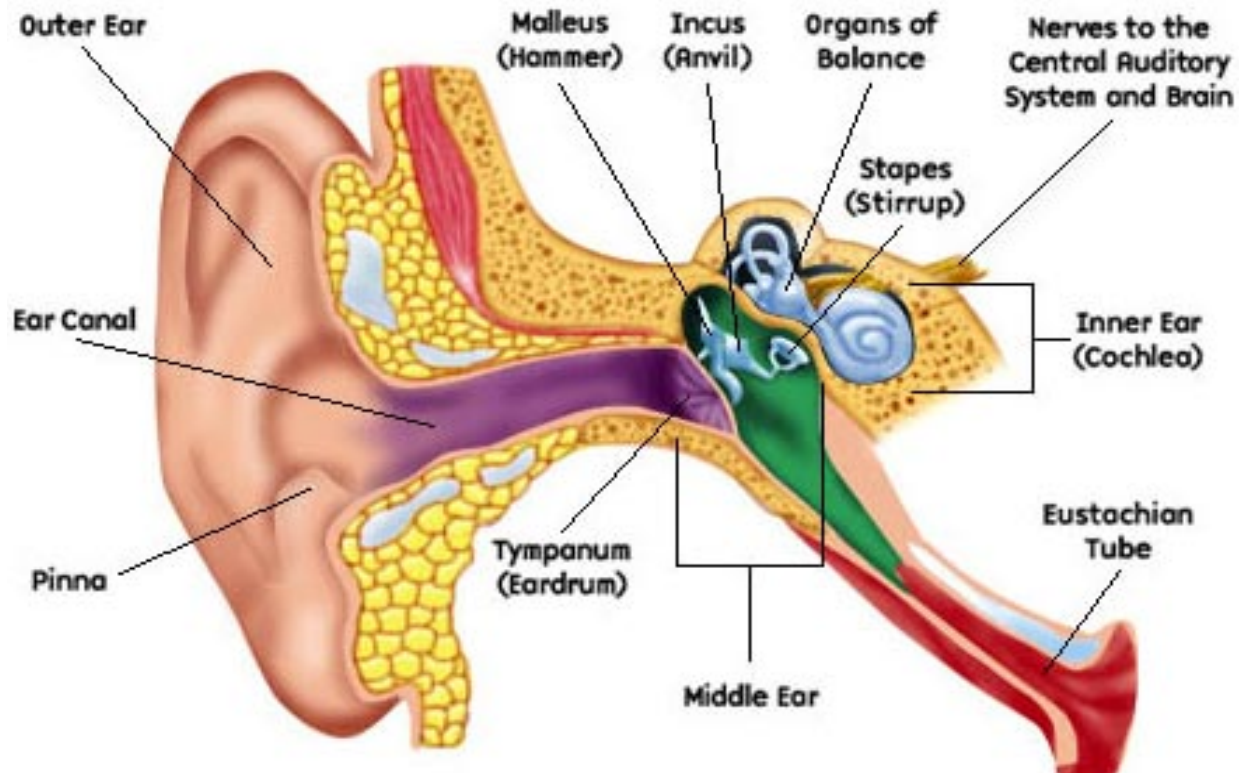
SECTIONS OF THE EAR



FUNCTIONS

- Outer and middle
 - hearing and sound wave conduction
- Inner
 - hearing and balance or equilibrium

ANATOMY



EXTERNAL EAR ANATOMY

- Auricle-pinna
- External auditory canal (EAC)

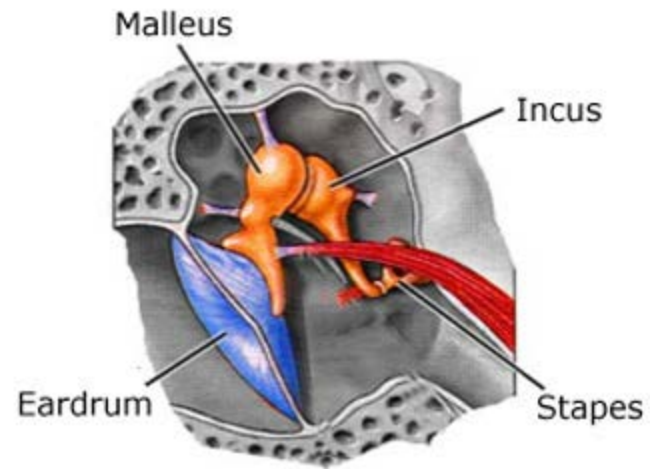
MIDDLE EAR ANATOMY

- Tympanic Membrane(TM)-ear drum



MIDDLE EAR ANATOMY

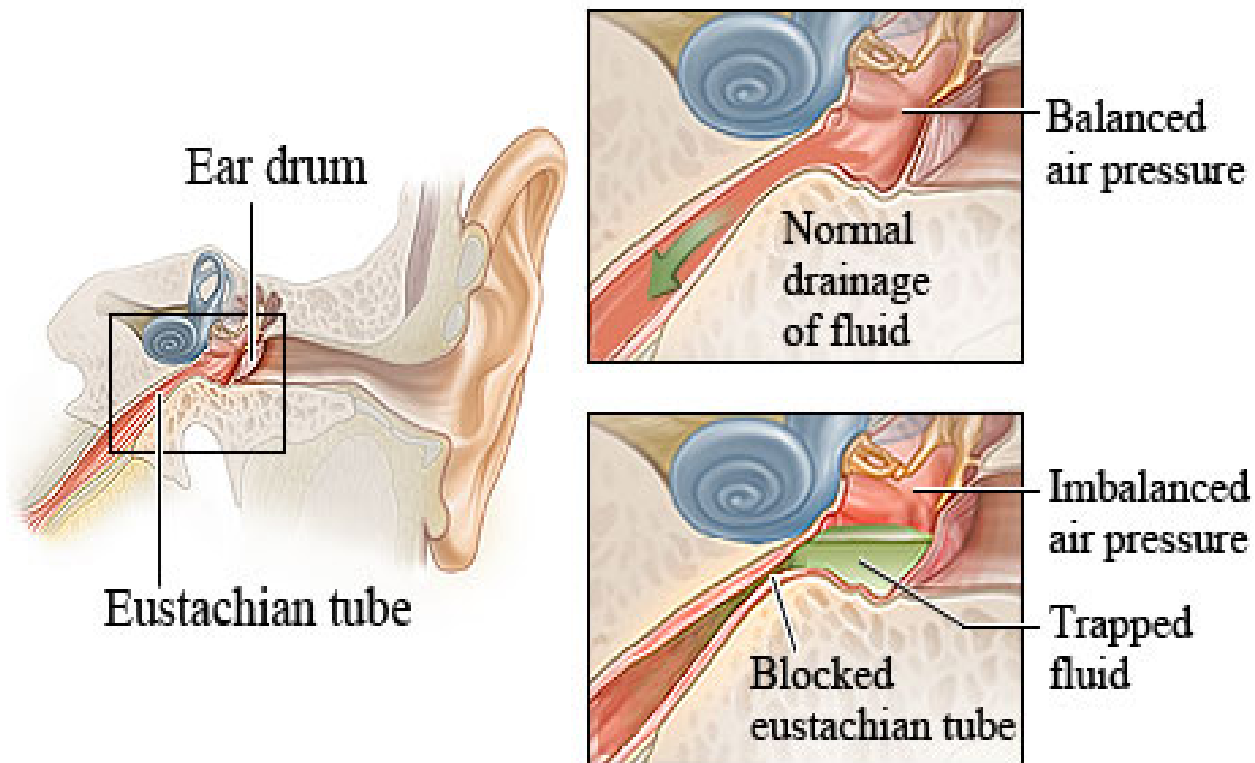
- Ossicles
 - Malleus (hammer)
 - Incus (anvil)
 - Stapes (stirrup)



MIDDLE EAR ANATOMY

- Eustachian Tube
 - Connects middle ear with nasopharynx
 - Pressure valve
 - Drain

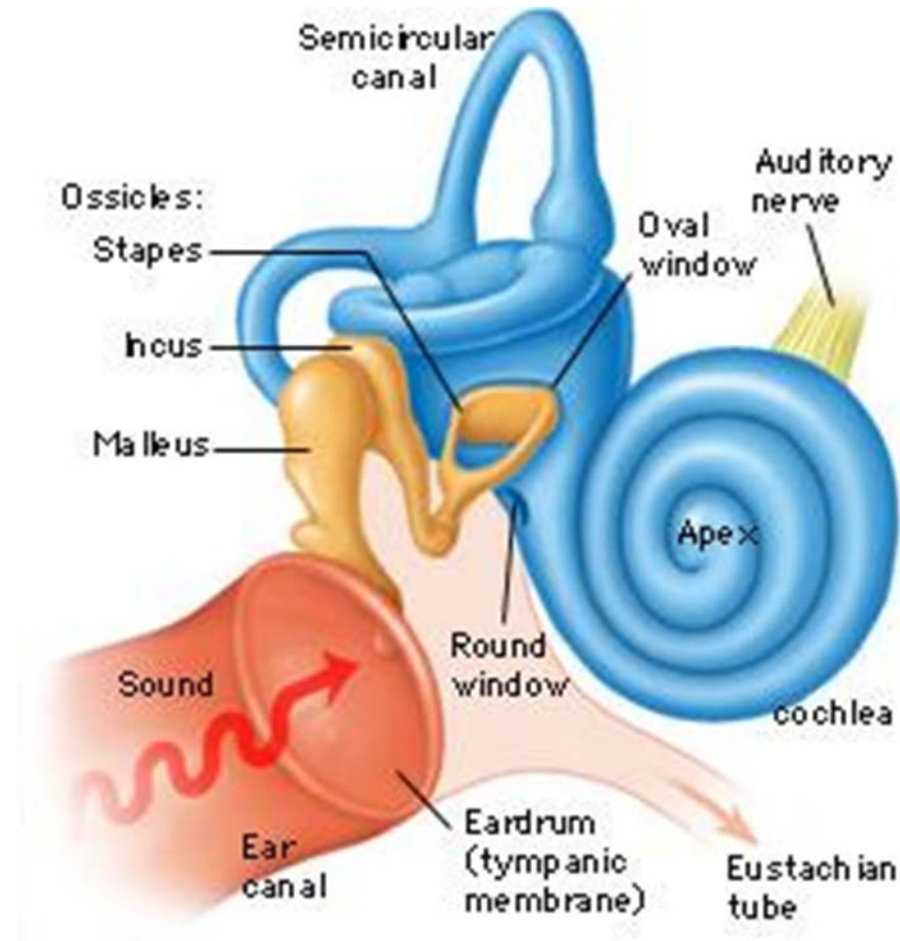
EUSTACHIAN TUBE



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INNER EAR ANATOMY

- Semicircular canals, vestibule & cochlea



INNER EAR ANATOMY

- Vestibular Labyrinth System
 - Balance and equilibrium
 - Vestibular nerve
 - Works with eyes muscles to keep vision steady with body movement

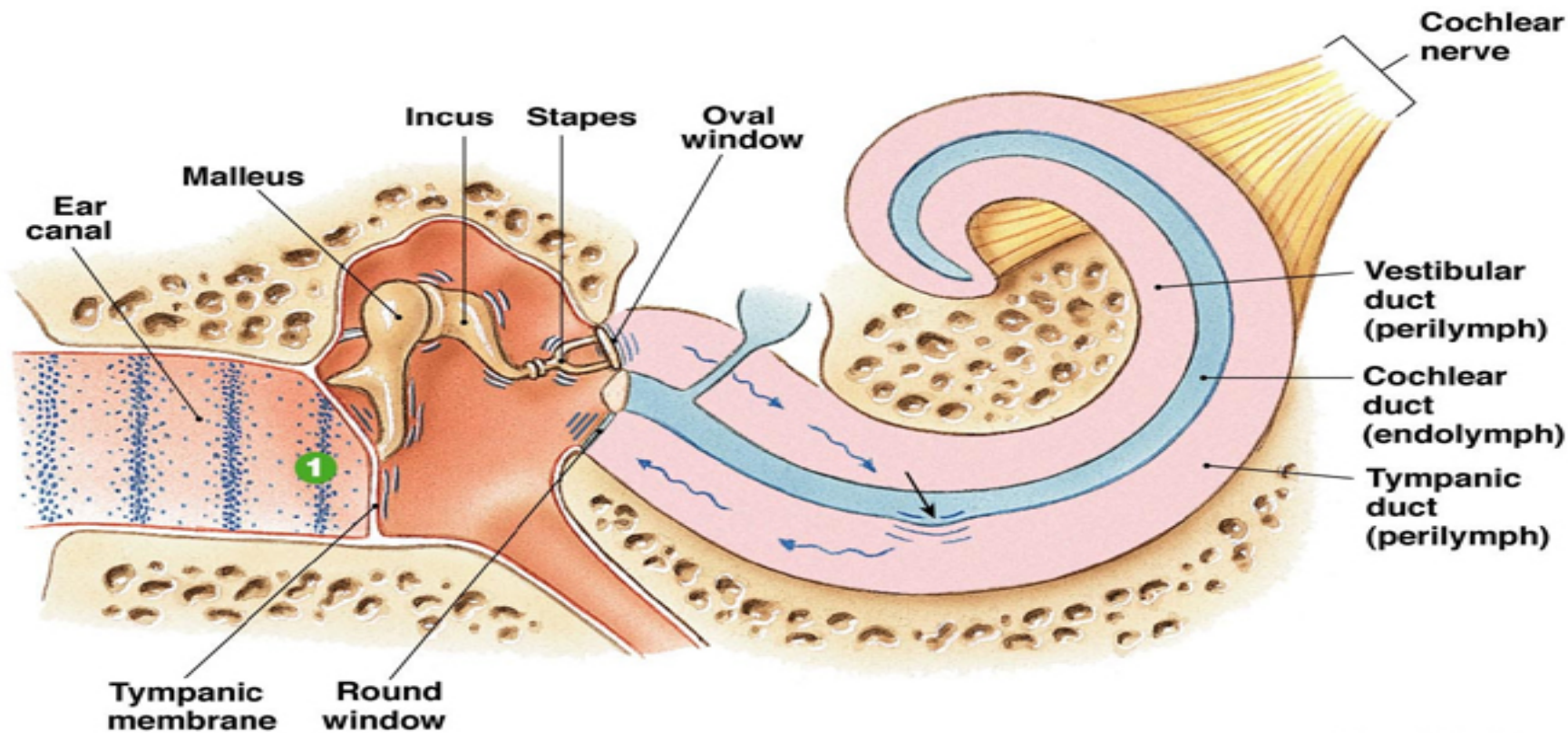
INNER EAR ANATOMY

- Oval window
 - Stapes rests against this membrane

- Cochlear Labyrinth
 - Cochlea is main auditory portion

 - Spiral structure resembling snail

TRANSMISSION OF SOUND WAVES

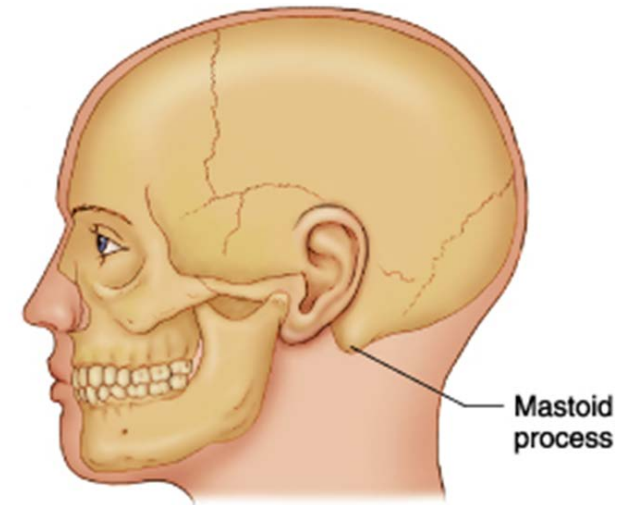


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Fig. 10-19

MASTOID PROCESS

- Projects from temporal bone behind the ear



- Spongy bone resembling honeycomb
- Connected to middle ear therefore middle ear infections can spread to the mastoid

ICD-10-CM

- Requires laterality & specificity
 - Specific causes for Otitis Externa; recurrent status code choices for OM
 - Conductive and sensorineural hearing loss differentiated by laterality and further by status of contralateral side

OTITIS MEDIA

ICD-9

21 codes for OM

ICD-10

80 codes for OM

HEARING LOSS

- Conductive
 - Impairment of sound conduction from outer ear to the ossicles in the middle ear
 - Reduction in sound level and inability to hear soft sounds
 - Generally correctable with medical or surgical intervention

HEARING LOSS

- Sensorineural
 - Damage to the cochlea or nerve pathways from inner ear to brain
 - Permanent in nature

- Mixed
 - Components of both conductive & sensorineural

HEARING LOSS

- Ototoxic
 - Drugs or chemicals toxic to auditory system
 - Antibiotics, chemotherapy agents, anticonvulsant, diuretics
- Presbycusis
 - Progressive age related hearing loss
 - Usually high pitched sounds

CIRCULATORY SYSTEM



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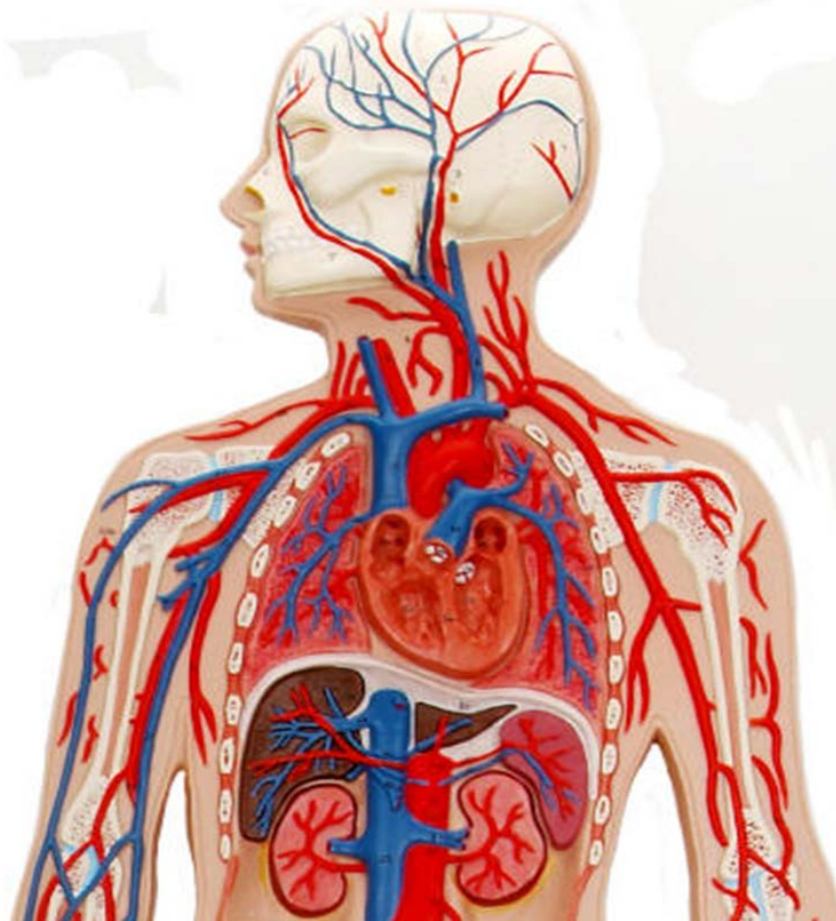
FOR PRESENTATION PURPOSES ONLY

CIRCULATORY SYSTEM

- Cardiovascular and Lymphatic Systems
- Function-move blood and lymph throughout body in continuous, controlled manner

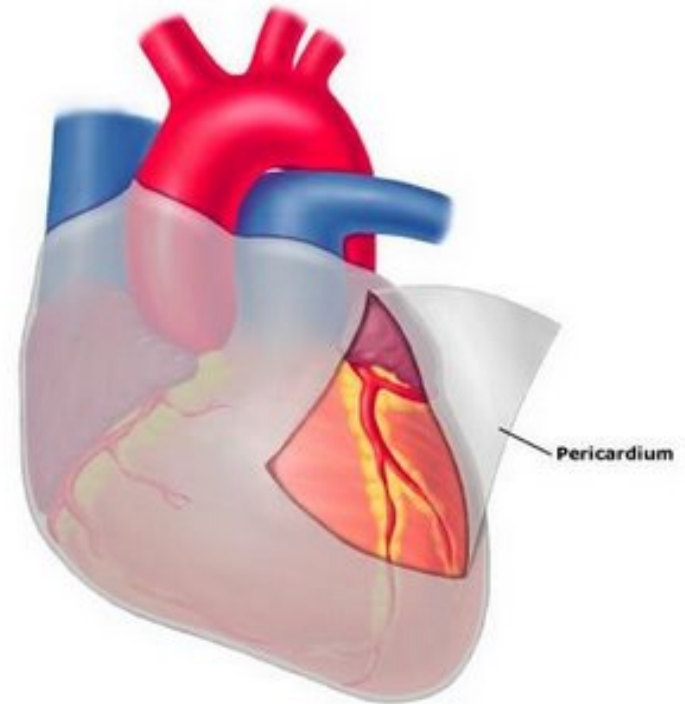
ORGANS OF CIRCULATORY SYSTEM

- Heart and blood vessels

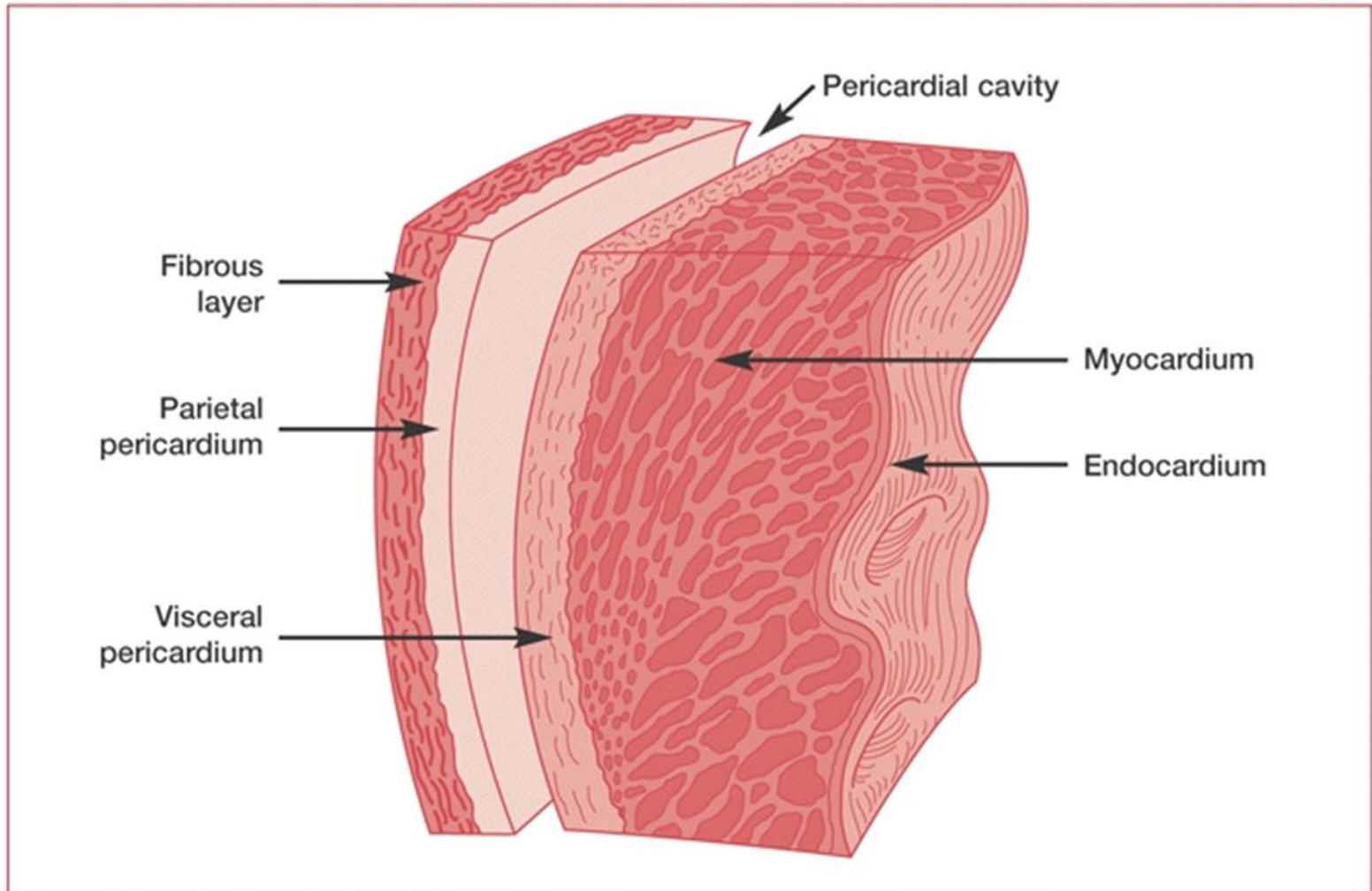


HEART

- Pericardium
 - Sac enclosing the heart

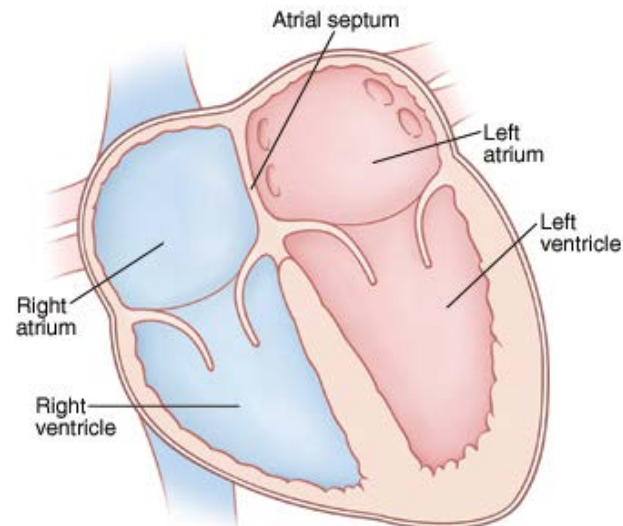
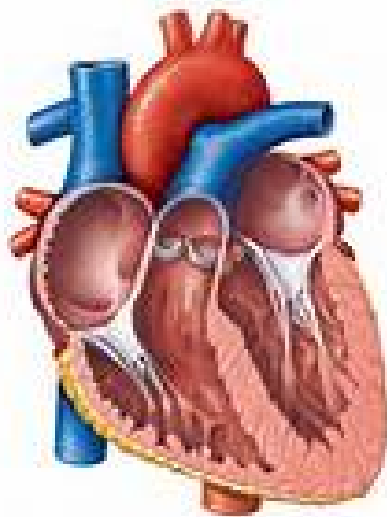


HEART WALL

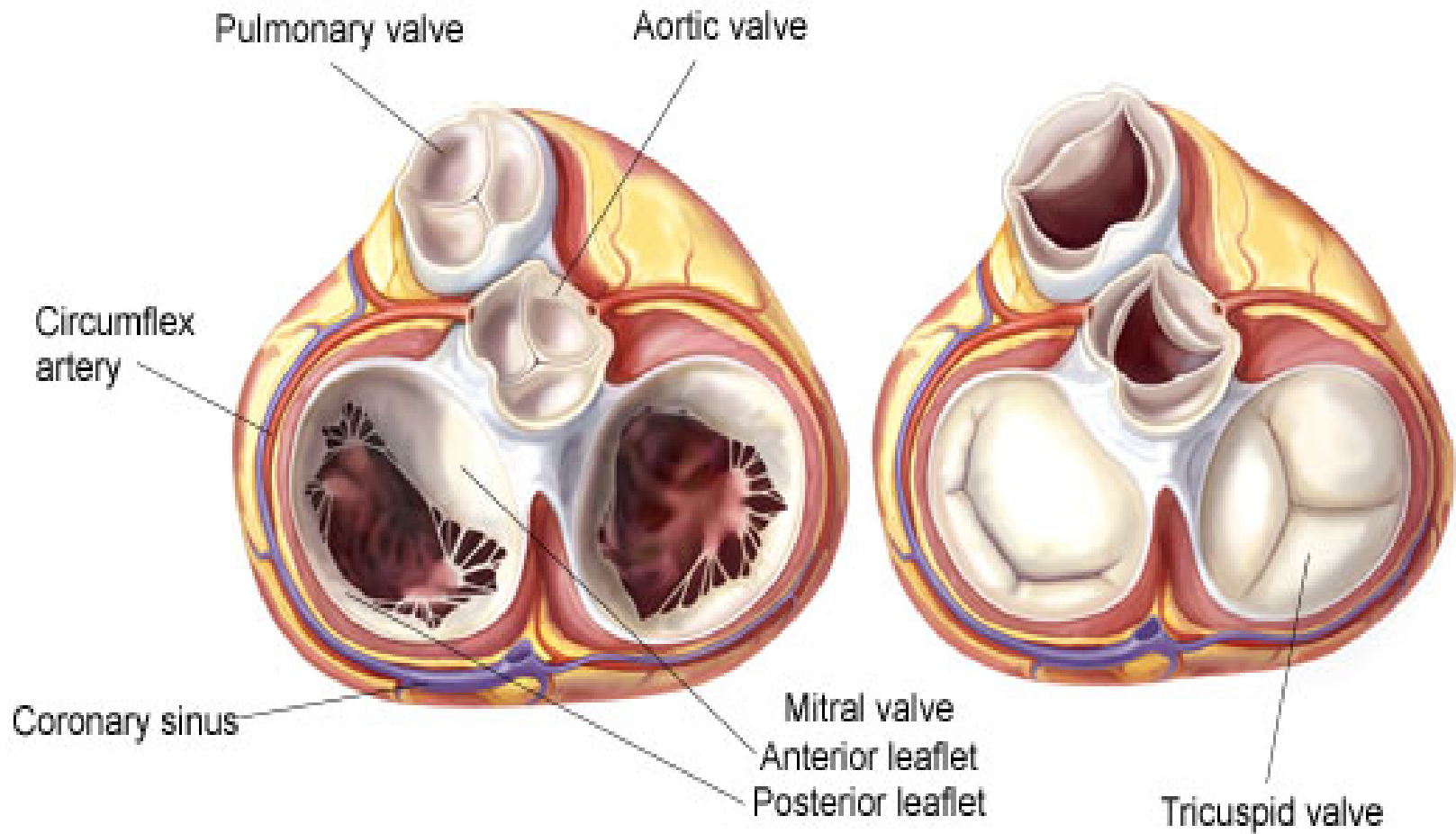


HEART CHAMBERS

- Chambers
 - Right/Left Atrium
 - Right/Left Ventricle
 - Septum-interatrial/interventricular



HEART VALVES



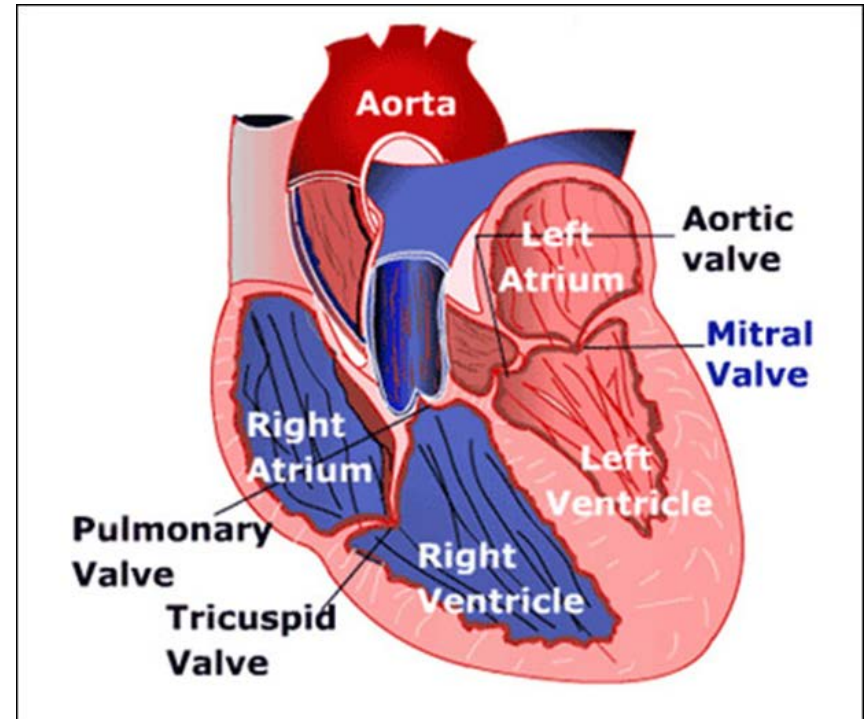
HEART VALVES

- Atrioventricular-

- Right=Tricuspid valve
- Left=Mitral valve

- Semilunar

- Pulmonic valve
- Aortic valve

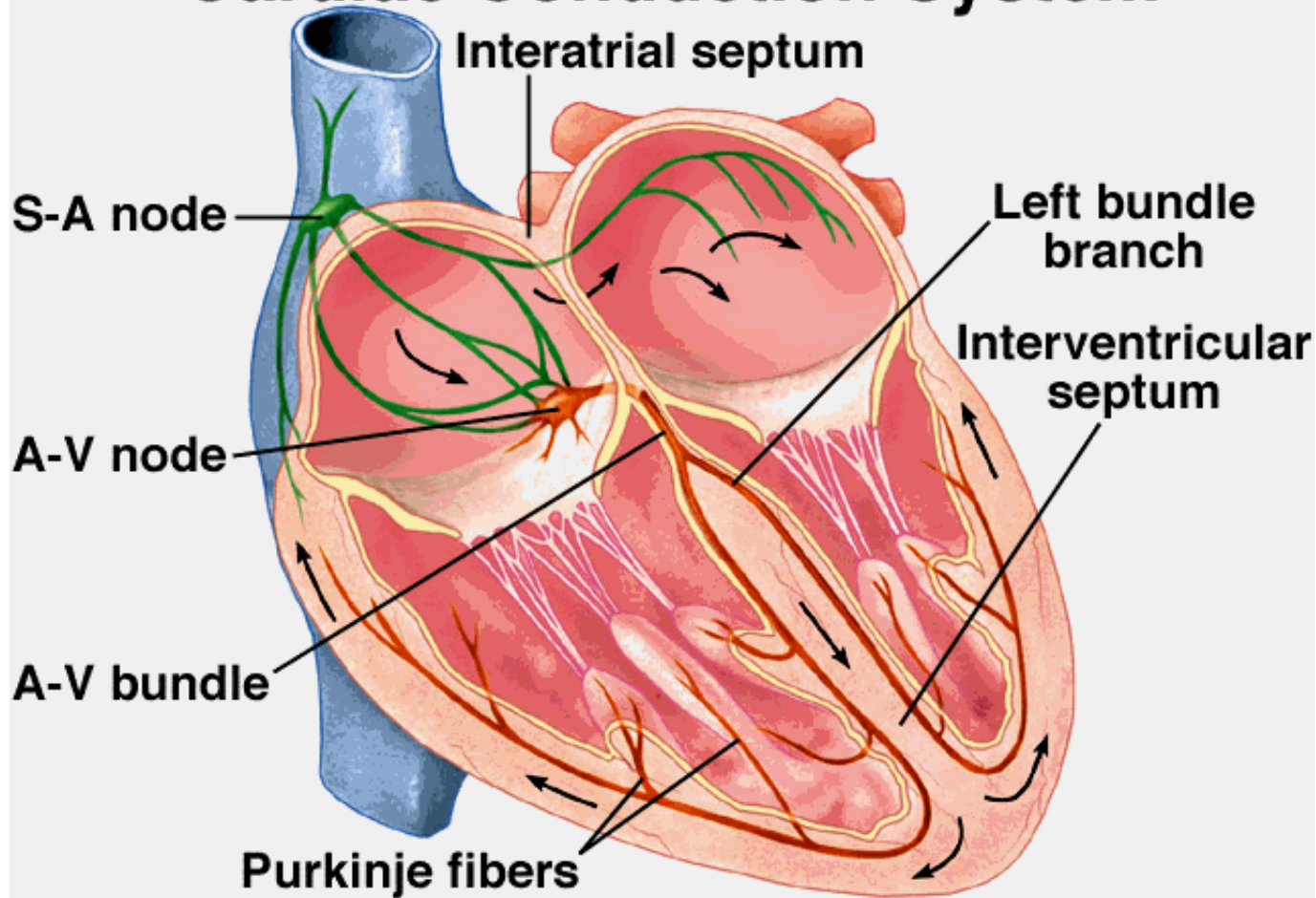


- Conduction
 - Sinoatrial (SA) node-pacemaker of the heart
 - Atrioventricular (AV) node-modify heart rate and cardiac output in response to body requirements
 - Atrioventricular bundle (Bundle of His)
 - R, L Bundle branches
 - Purkinje fibers

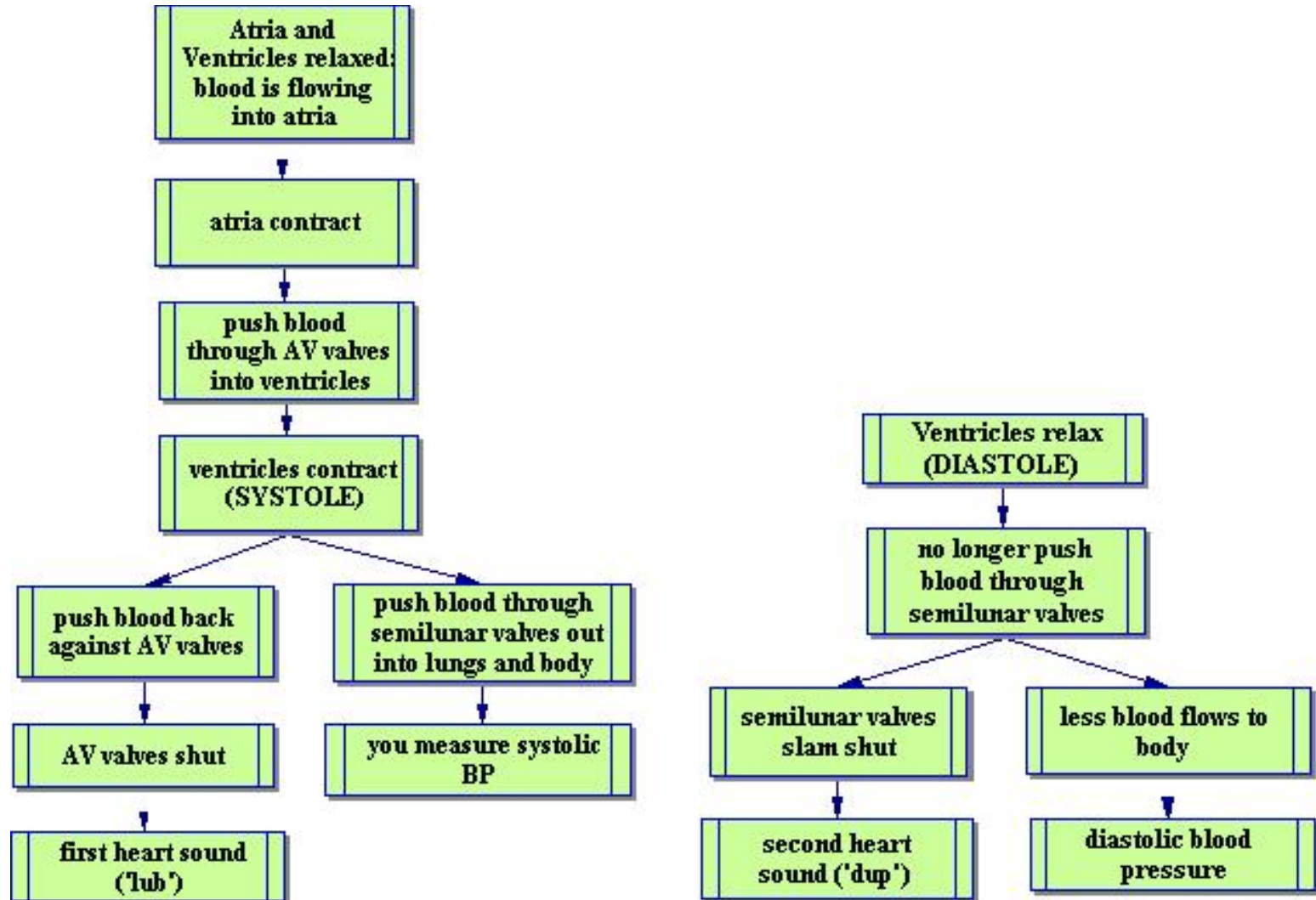
CONDUCTION

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Cardiac Conduction System



CARDIAC CYCLE

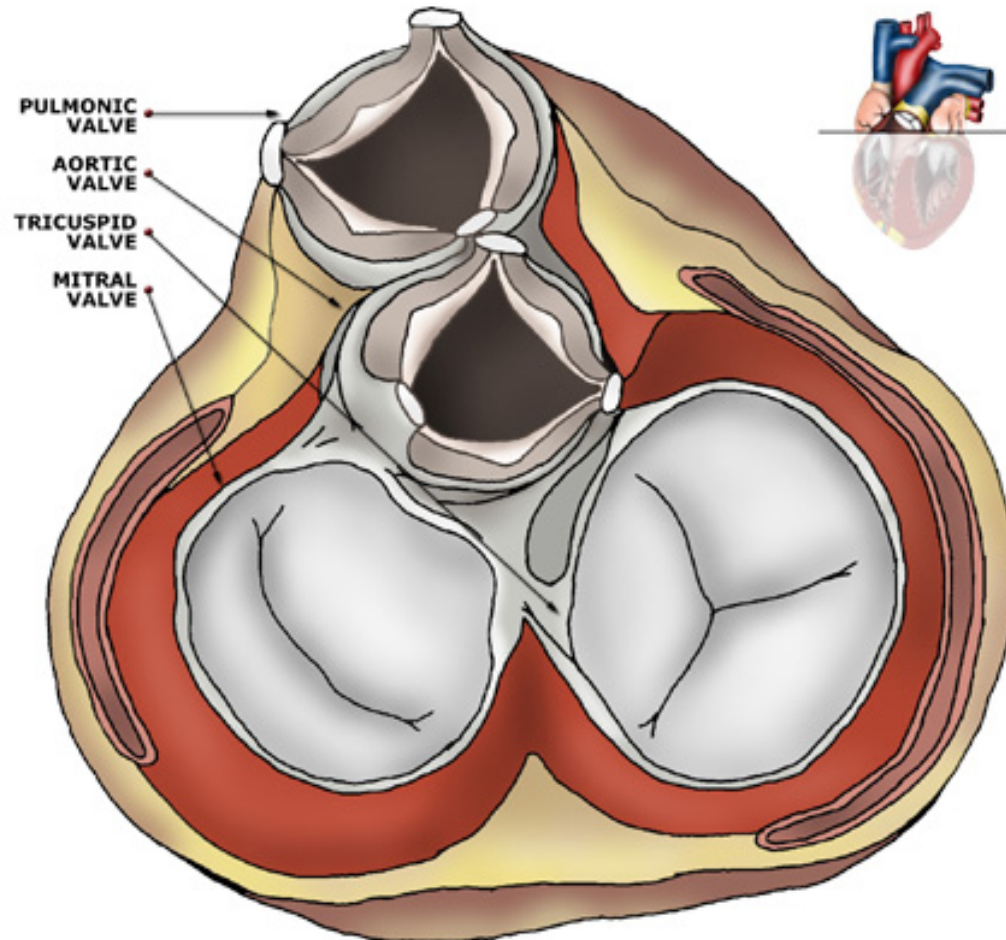


CARDIAC CYCLE

- During contraction (systole), atrioventricular valves close preventing backflow into atria and blood is pumped into the arteries
- During relaxation (diastole), AV valves are open to allow blood to flow through to ventricles
- Closing of valves produces heart sounds heard on physical examination

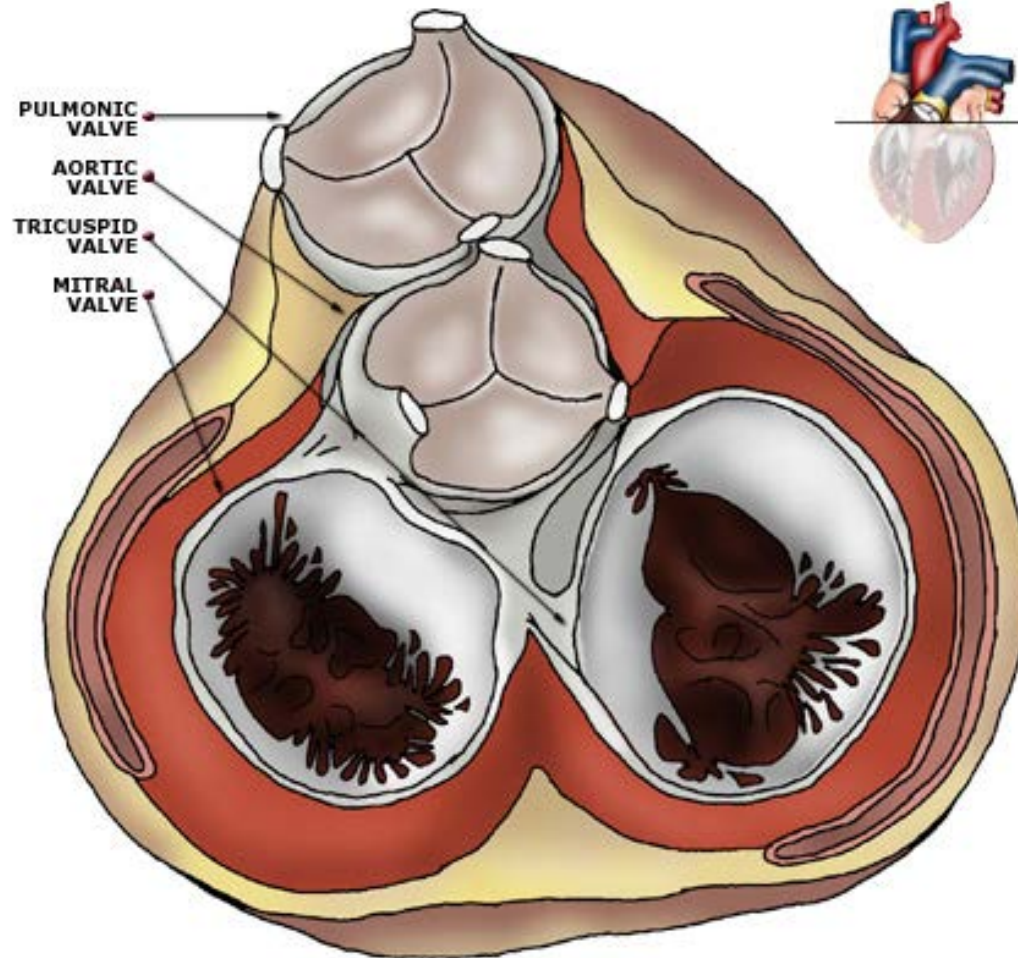
SYSTOLE

THE HEART IN SYSTOLE



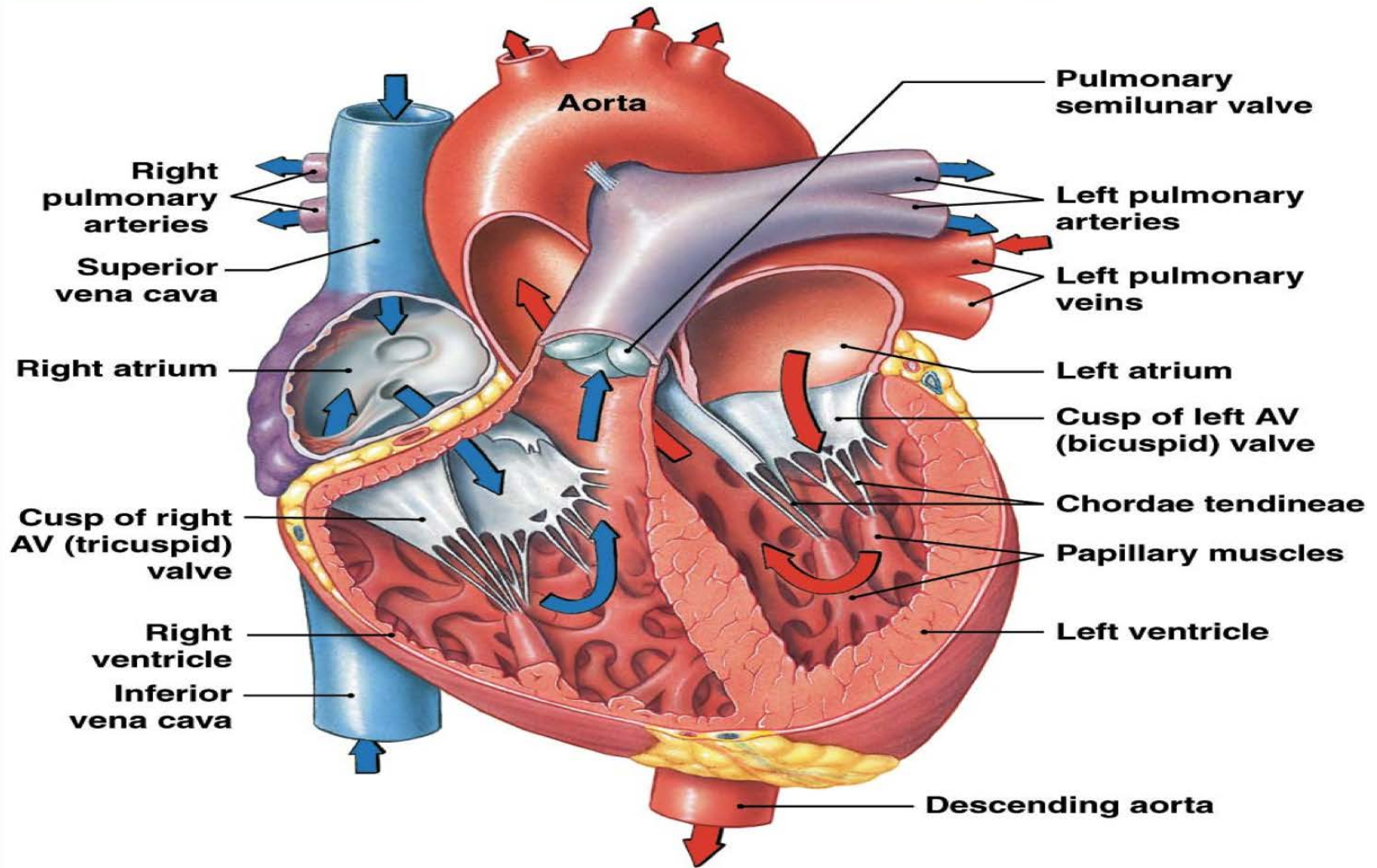
DIASTOLE

THE HEART IN DIASTOLE



BLOOD VESSELS

(g) One-way flow through the heart is ensured by two sets of valves.

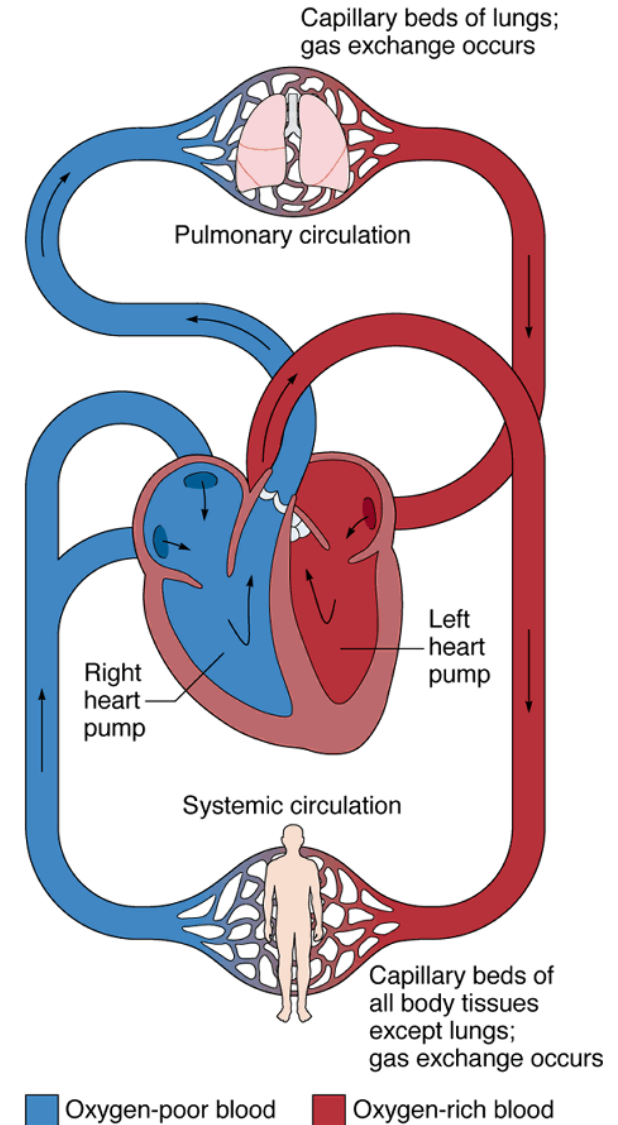


GREAT VESSELS

- Great Vessels
 - Pulmonary vein (PV)
 - Pulmonary artery (PA)
 - Superior and inferior vena cava (SVC, IVC)
 - Aorta

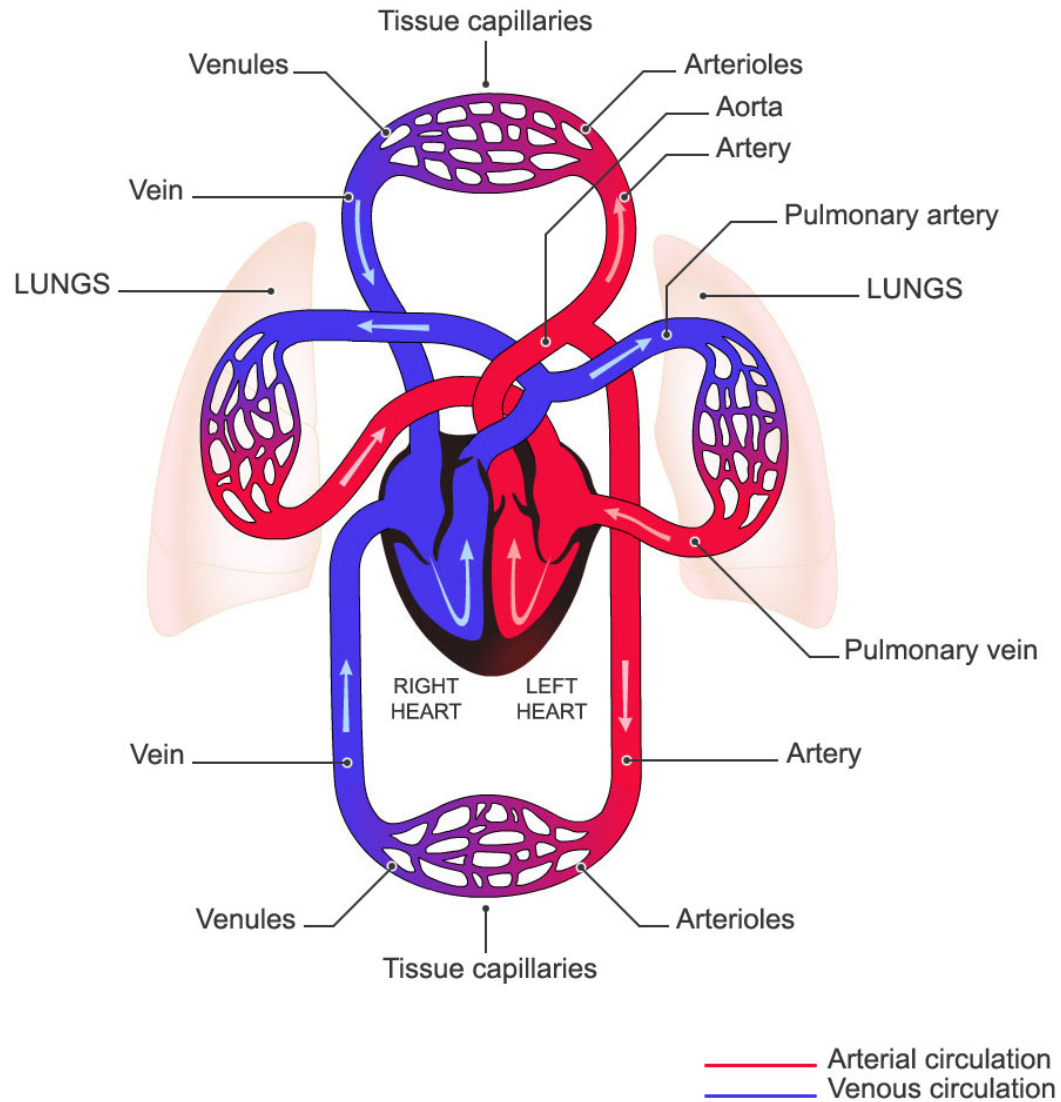
CIRCULATION

- Pulmonary circulation
 - PA, PV
- Systemic circulation
 - SVC, IVC, Aorta



- Circulatory Routes
 - Ascending aorta
 - Aortic arch
 - Descending aorta
 - *Thoracic*
 - *Abdominal*
 - Table 6.1 Chapter 6

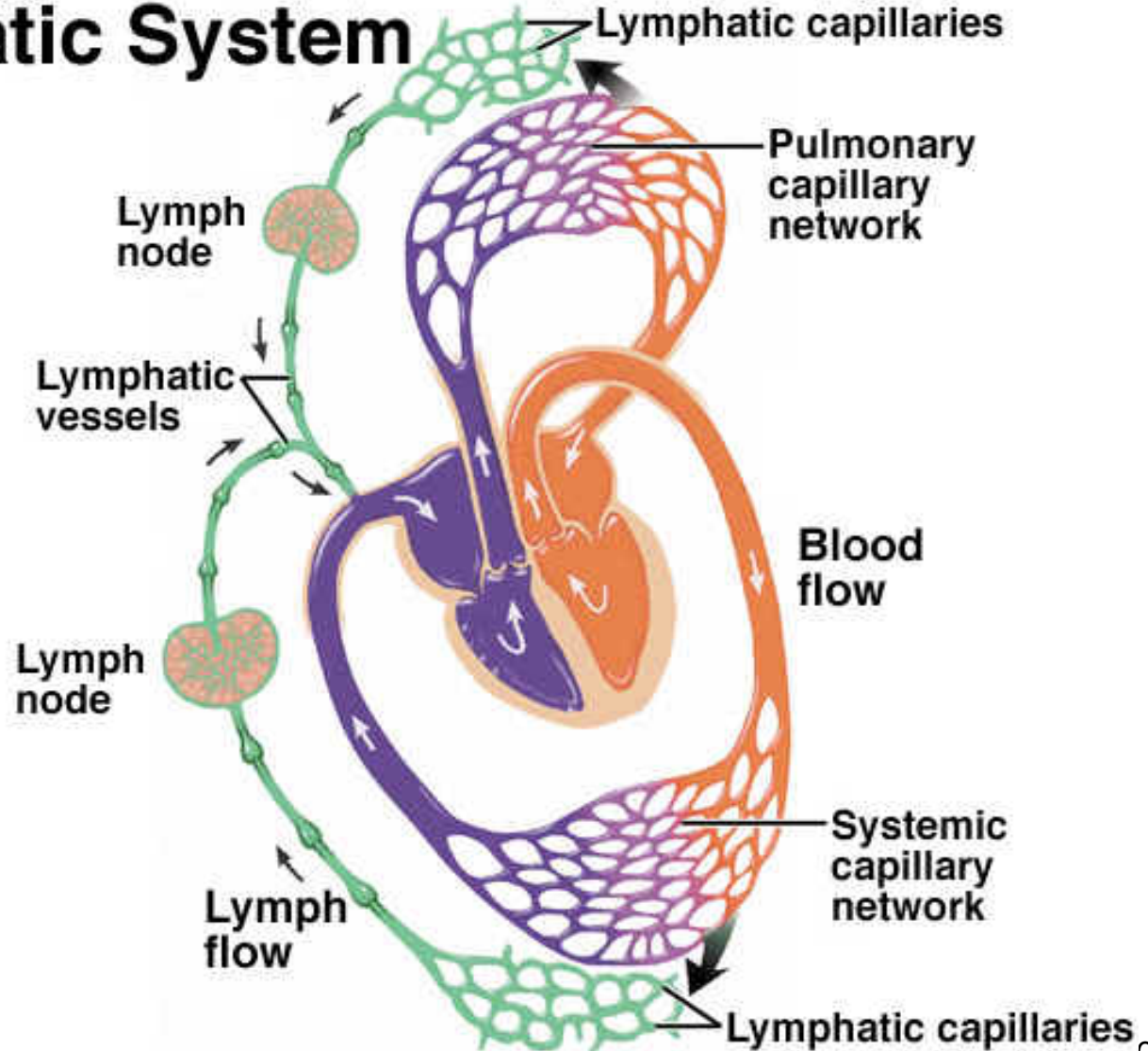
PHYSIOLOGY



LYMPHATIC SYSTEM

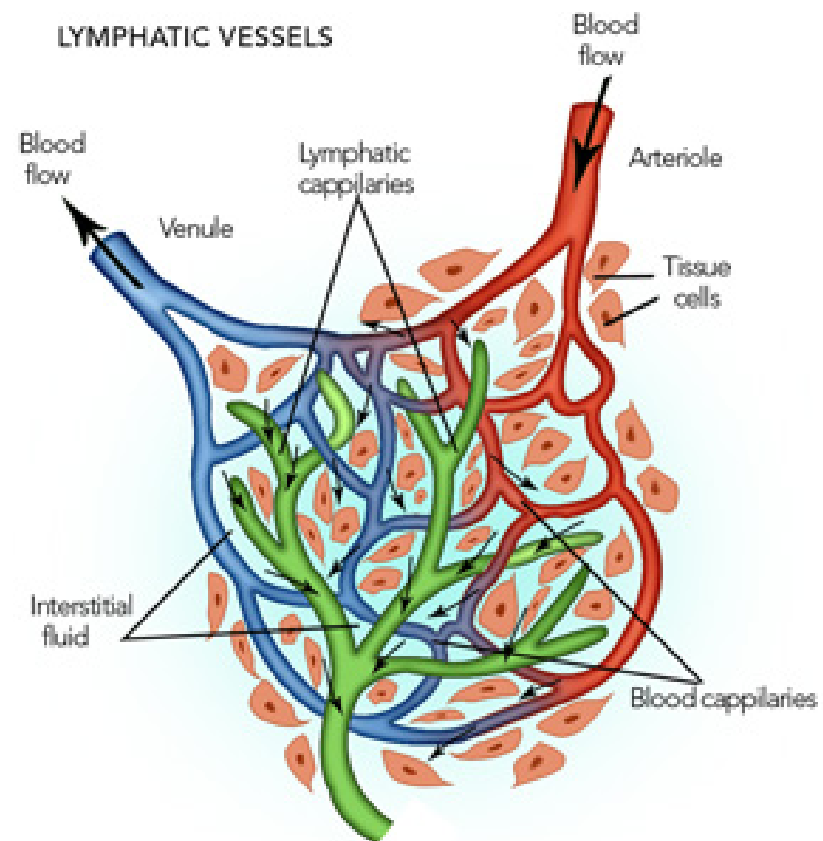
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Lymphatic System



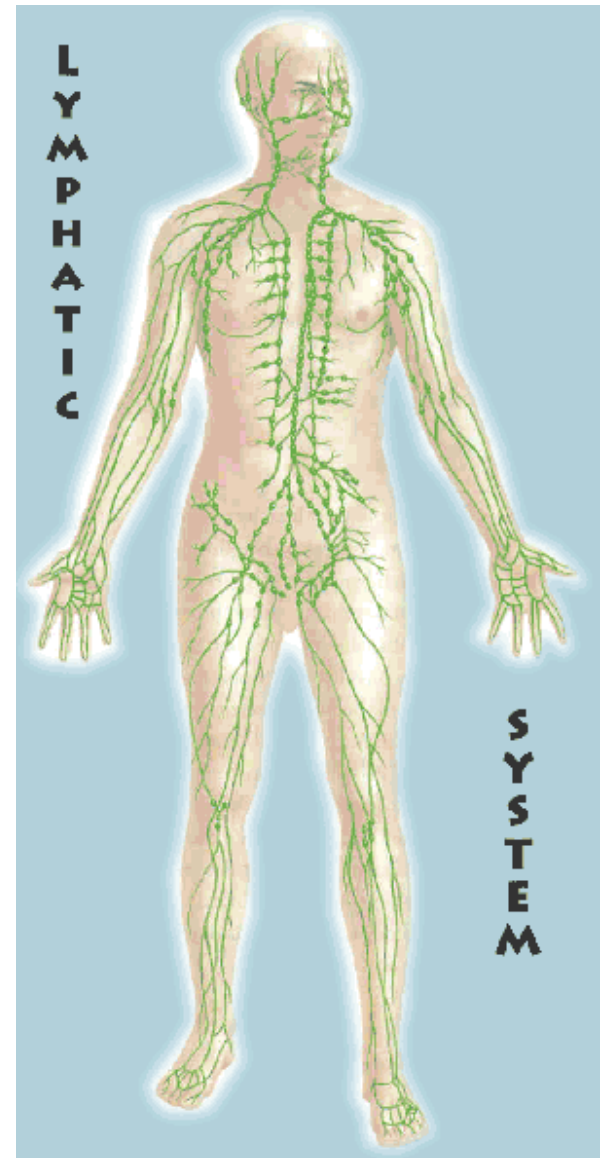
COMPONENTS

- Interstitial fluid
- Lymph



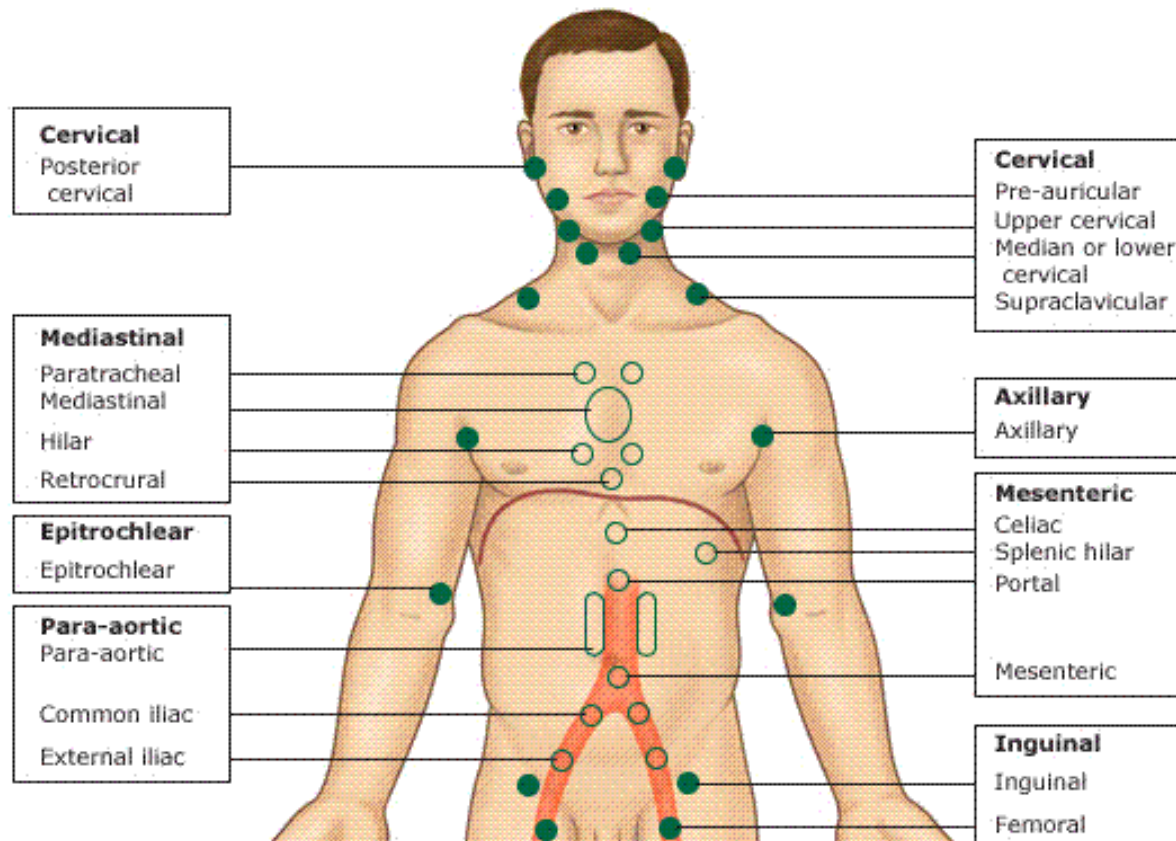
COMPONENTS

- Lymphatic vessels
 - Lymphatic trunks
 - Lumbar, intestinal,
 - bronchomediastinal,
 - intercostal, subclavian,
 - jugular
 - R, L thoracic lymphatic ducts



COMPONENTS

- Lymph Nodes



COMPONENTS

- Lymph Organs
 - Tonsils
 - Spleen
 - Thymus
 - Peyer's Patches
 - Appendix

ICD-10-CM CODING

- Combination codes for atherosclerotic heart disease with angina pectoris
 - Subcategories for native vessel vs. graft
- Myocardial infarction healing time reduced to 28 days (vs 8- wks.)
 - Subsequent MI

ICD-10-CM

- Subsequent episode of care designation restricted to new MI during 4-week healing period, not used for re-evaluation, observation, or treatments of MI treated on previous admission
- Same code for benign and malignant HTN
- Cerebral hemorrhage and infarction require laterality, specific artery involved or site of hemorrhage

ICD-10-CM

- Arterial and venous disease of the extremities requires specific location

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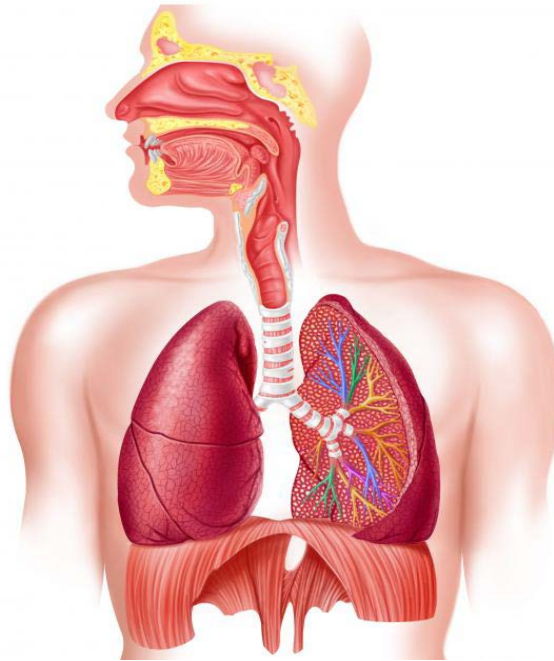
WWW.KOFFELSKIS.COM



"The defibrillator's not working! Quick, everyone scuff your feet on the carpet!"



RESPIRATORY SYSTEM



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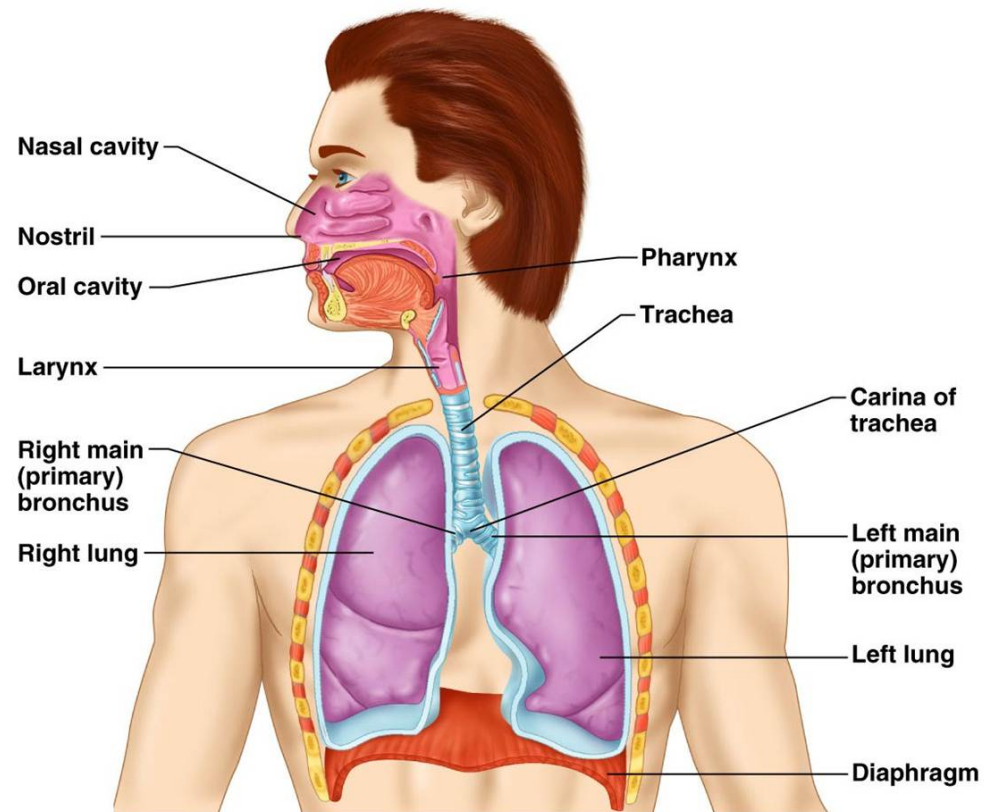
FOR PRESENTATION PURPOSES ONLY

- **Upper respiratory tract**

- Nasal cavity
- Paranasal sinuses
- Pharynx
- Larynx

- **Lower respiratory**

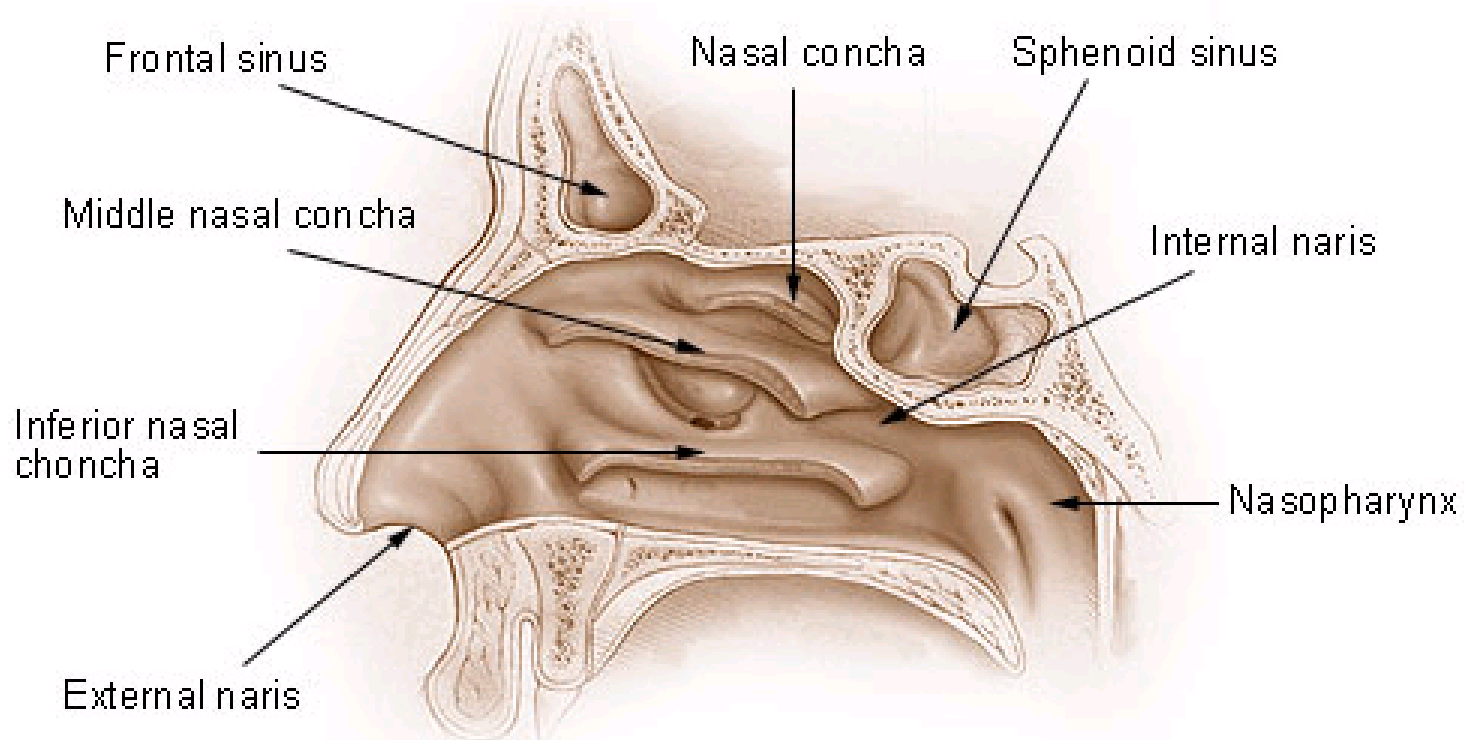
- Trachea
- Bronchi
- Lungs



- **Nasal Cavity**
- Nares/nostrils
- Nasal septum
- Inferior, middle, superior turbinate

NASAL CAVITIES

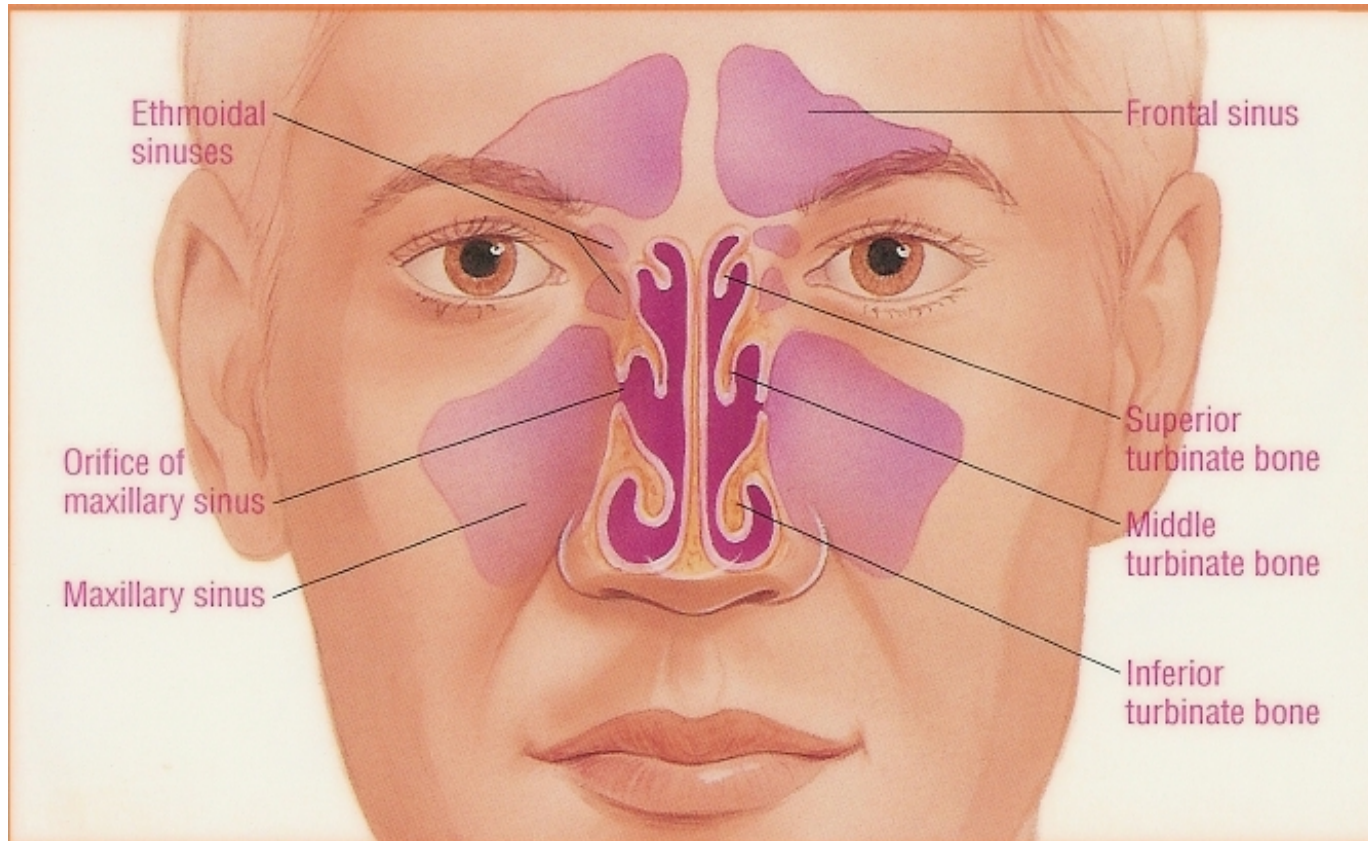
Nose and Nasal Cavities



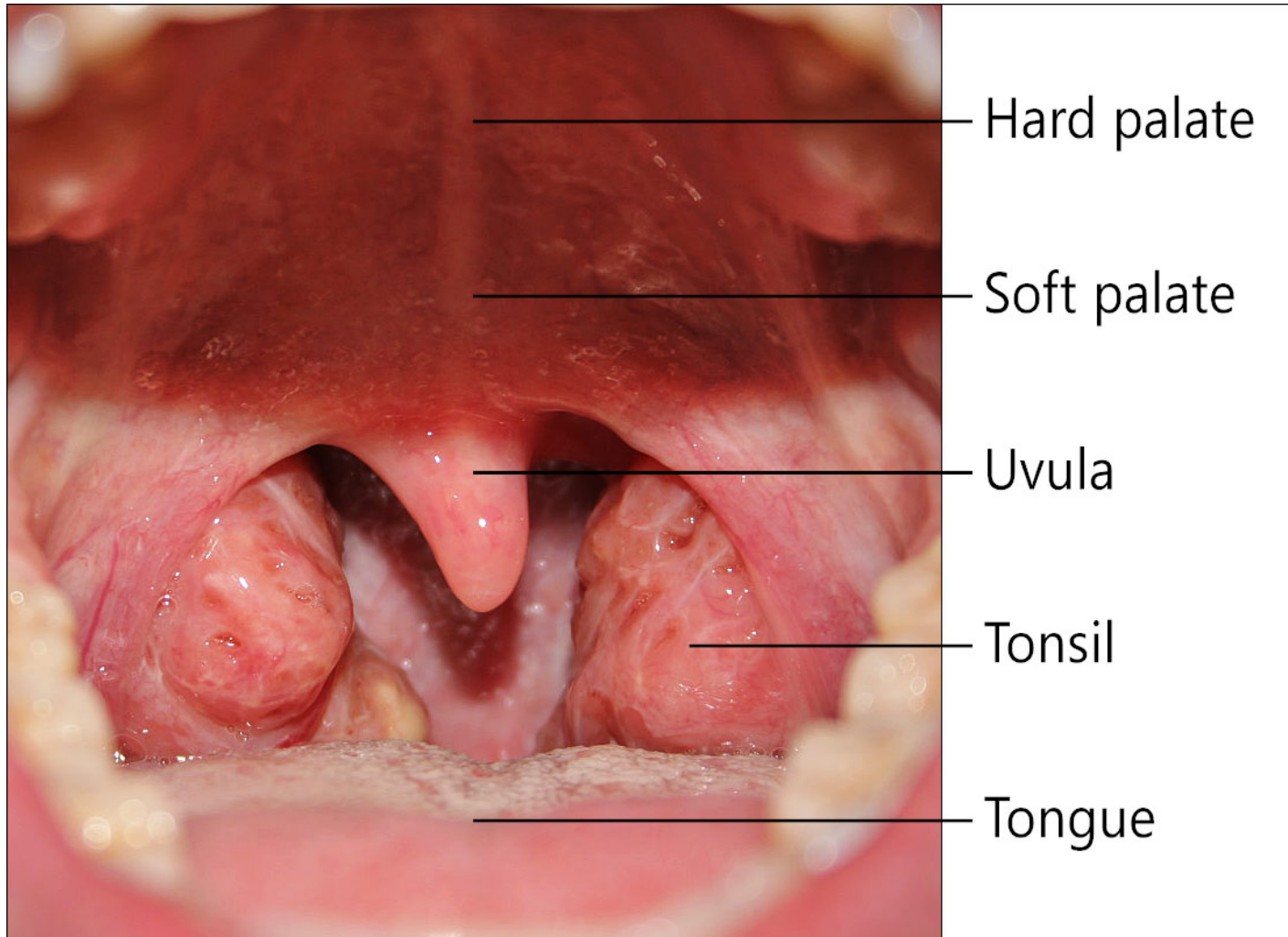
- **Paranasal Sinuses**
- Maxillary-largest, each side of nose
- Ethmoid-root of nose, behind bridge between eye sockets
- Frontal-above eyes and in the forehead area
- Sphenoid-small, deepest within skull behind ethmoid

- **Tonsils**
- Clumps of lymph tissue (lymphocytes)
- Traps viruses/bacteria entering throat

SINUS CAVITIES



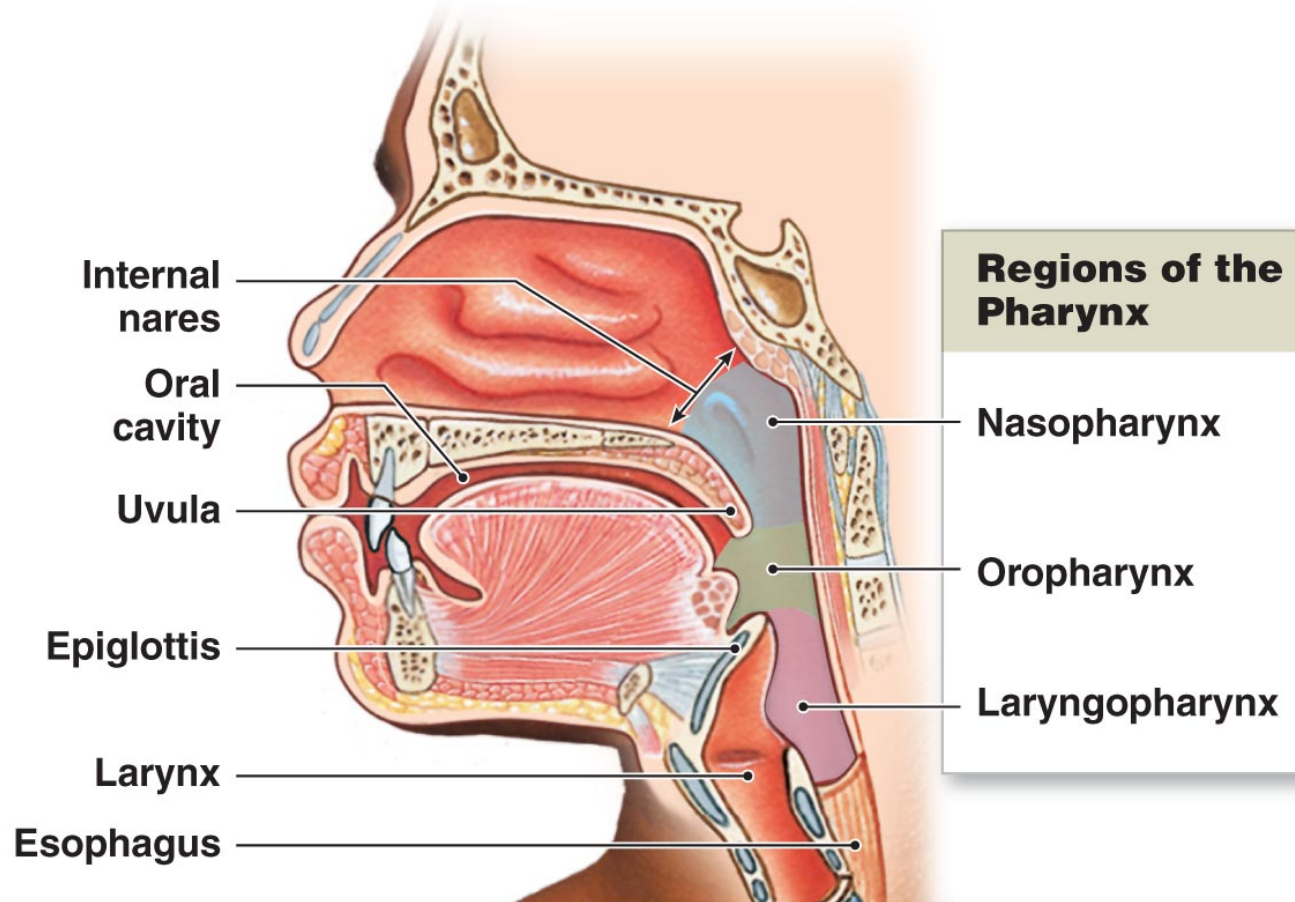
OROPHARYNX



- **Pharynx**
- Part of throat between nasal cavity and larynx
- Nasopharynx, oropharynx, hypopharynx/laryngopharynx

PHARYNX

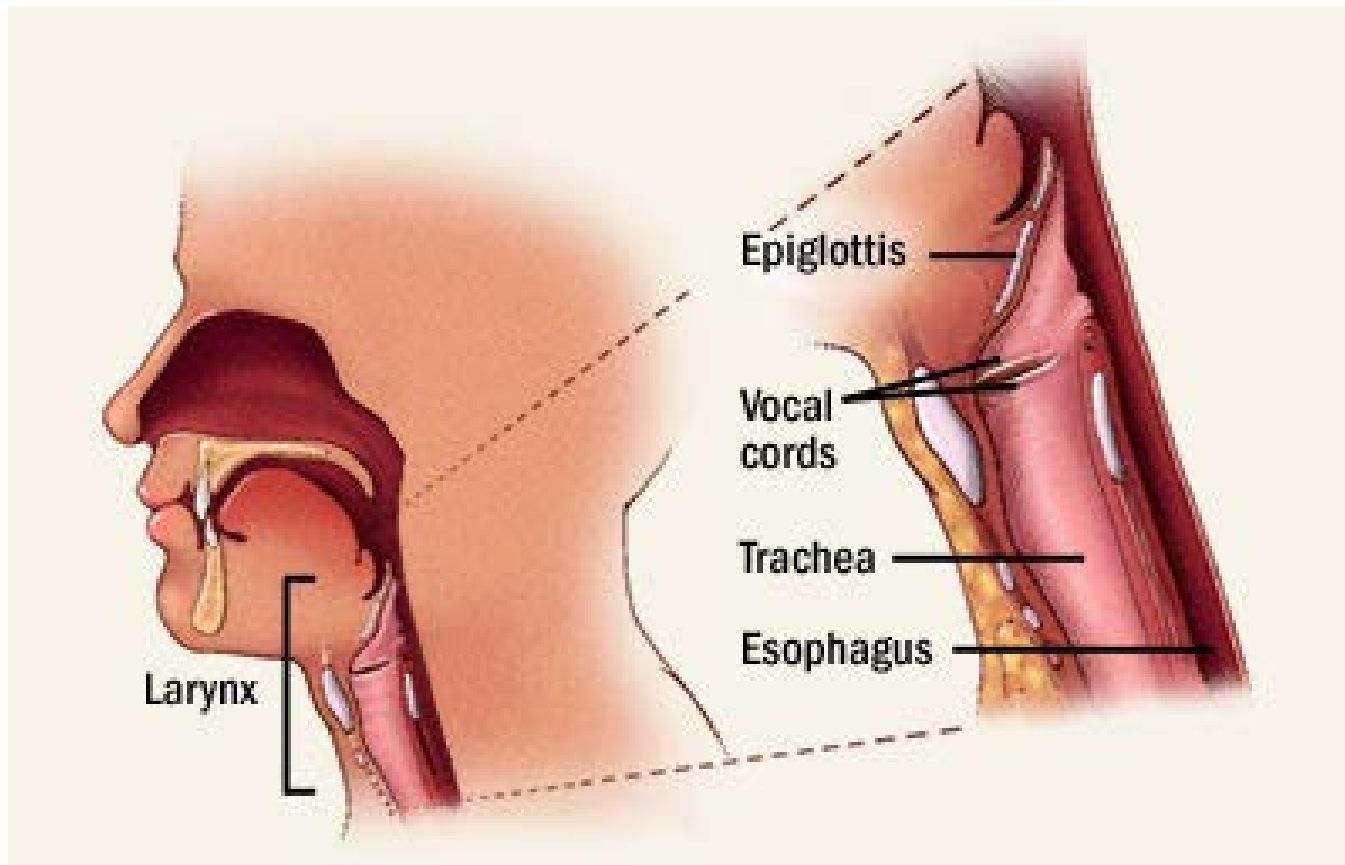
The pharynx, a common passageway for solid food, liquids, and air



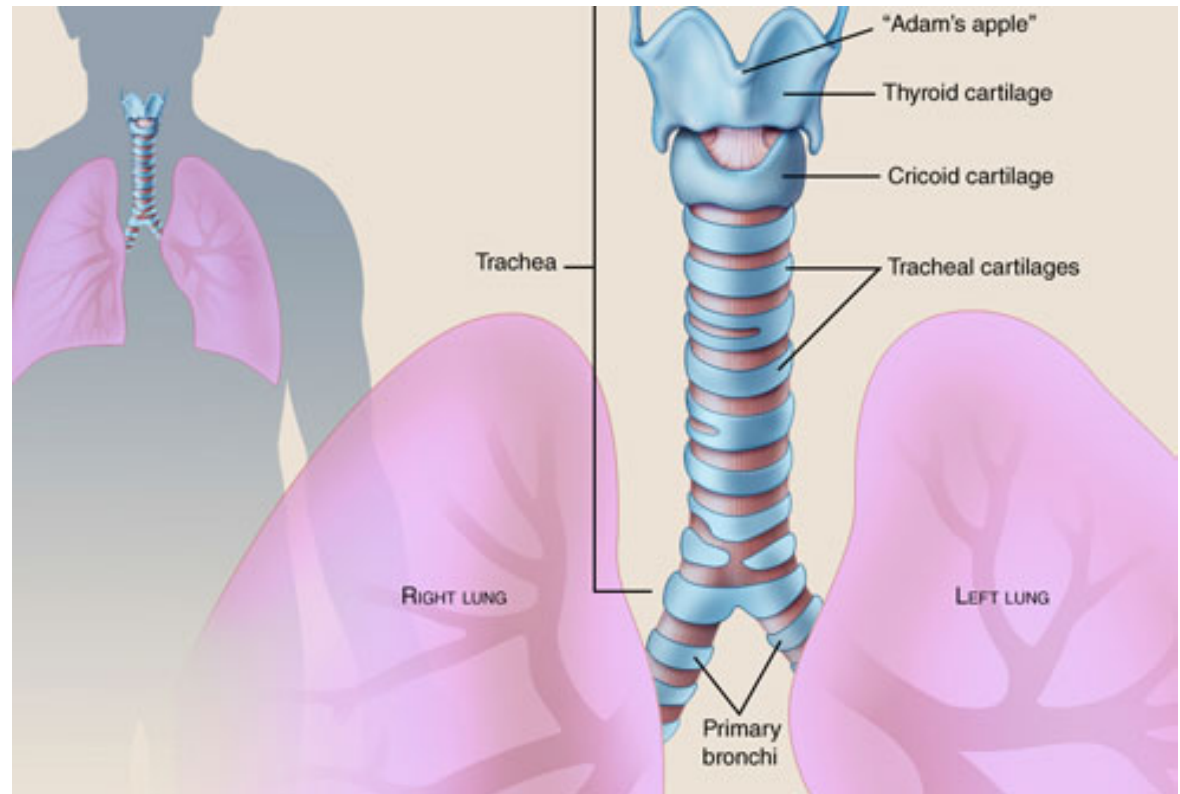
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- **Larynx**
- Connects pharynx to trachea
- Epiglottis-flap structure which covers opening to larynx during swallowing
- Vocal cords-elastic connective tissue and skeletal muscle that controls the tension on the folds
- With muscular contraction, the cords vibrate as air passes through, generating sound

LARYNX



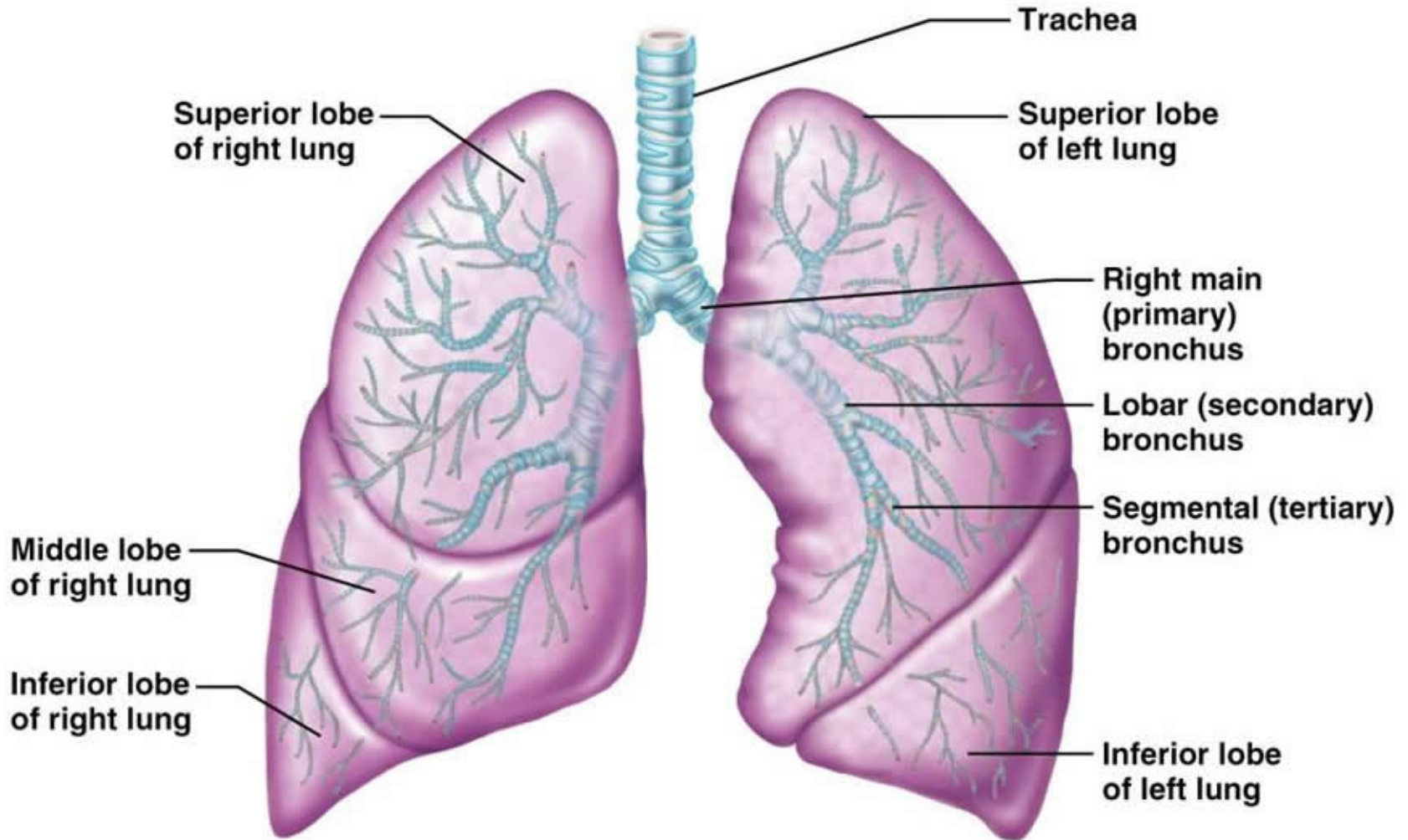
- **Trachea**
 - Windpipe



- **Bronchi**
- R & L main stem bronchus
- Branch into smaller bronchi into each lobe of lung-R lung (3), L lung (2)
- Bronchioles
- Alveoli

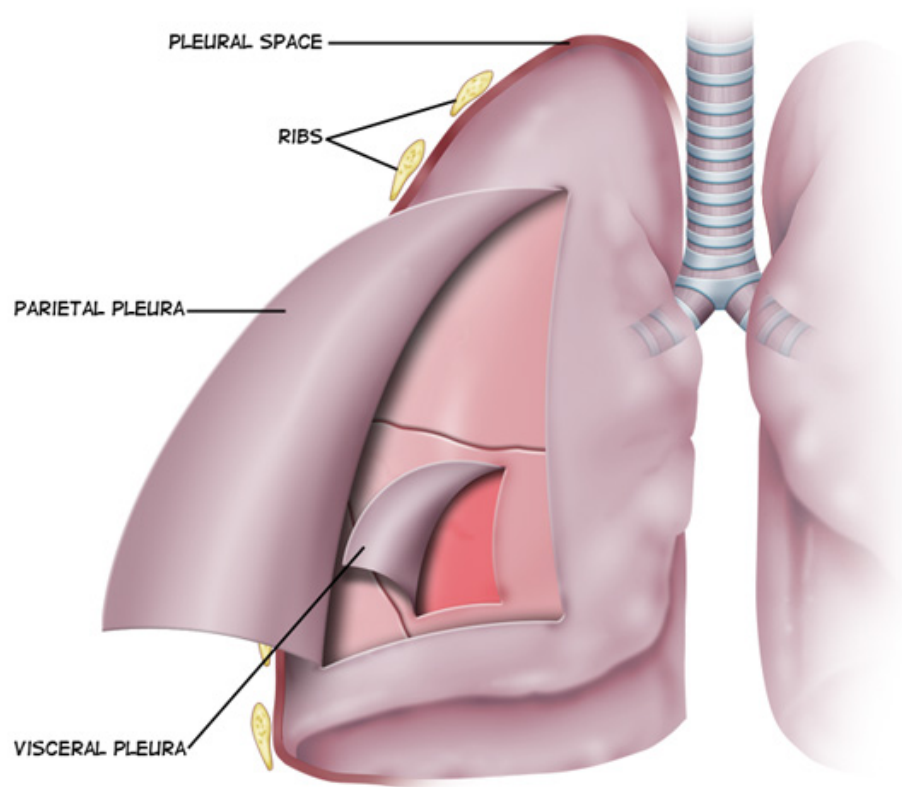
- **Lungs**
- R Lung-upper, middle, lower lobe
- L Lung-upper, lower lobe
- Mediastinum-space between lungs containing heart, great vessels, and esophagus
- Capillary beds in and around alveoli are site of gas exchange

LUNGS

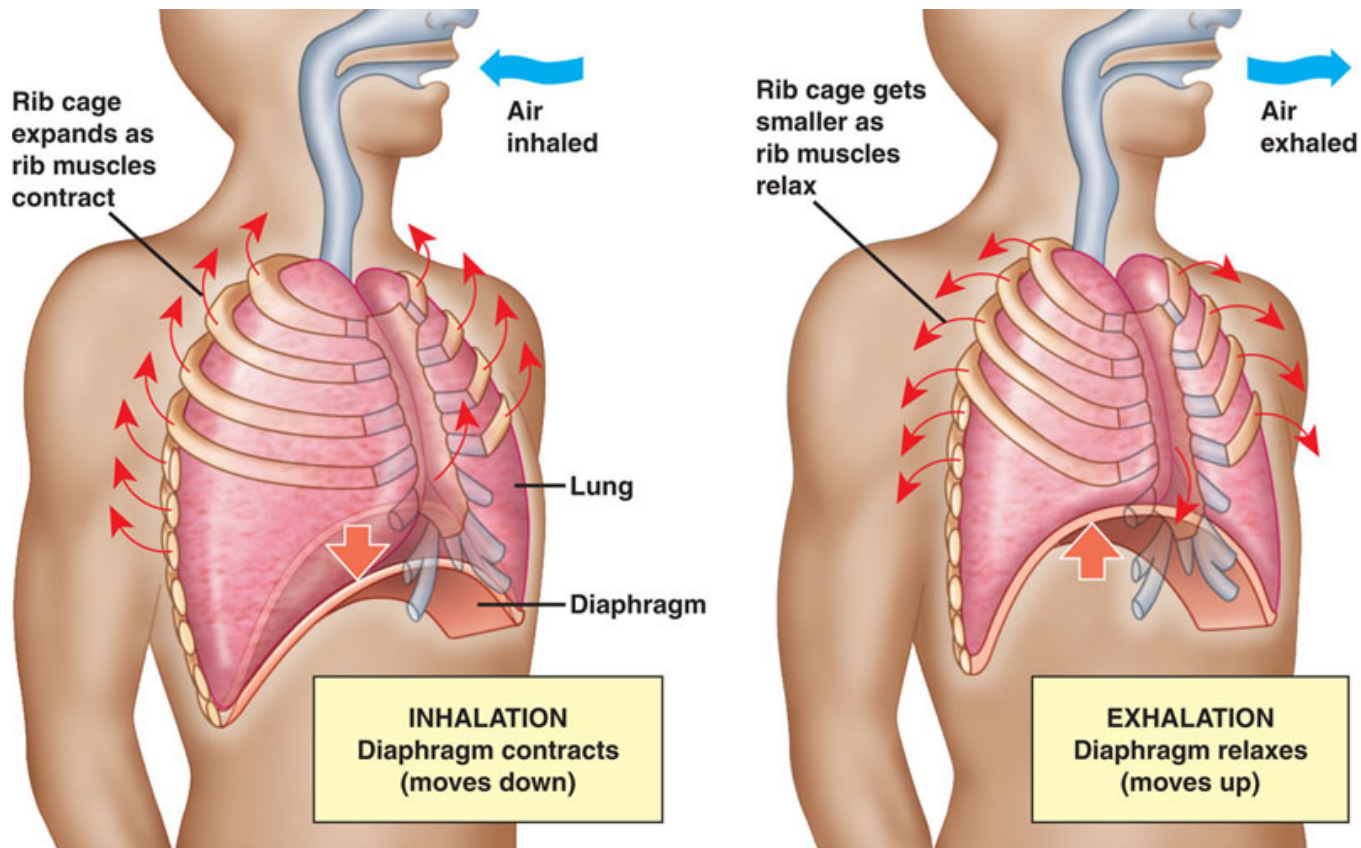


- **Pleura**
- Membrane that surrounds and adheres to the lungs, folds back on itself and lines the chest wall
- Pleural space

PLEURA

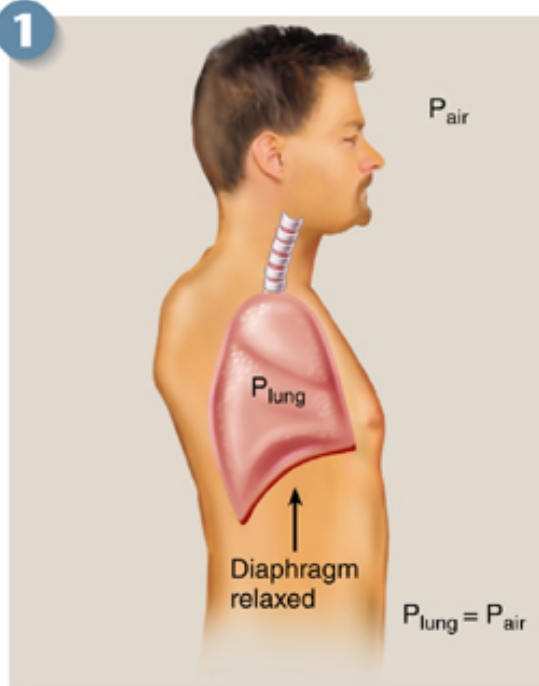


• Mechanics of Breathing

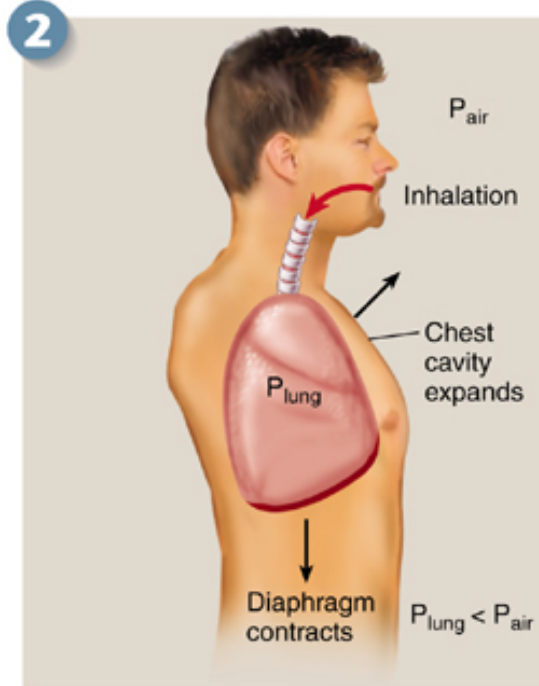


PHYSIOLOGY

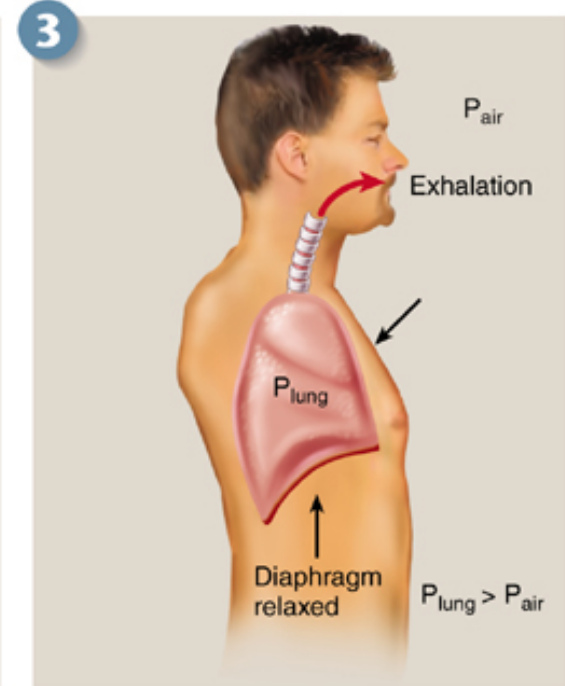
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Before inhalation, the air pressure in the lungs (P_{lung}) is equal to the atmospheric pressure (P_{air}).



During inhalation, the diaphragm contracts, and the chest cavity expands downward and outward. This increases the volume of the chest cavity and lungs, which reduces the air pressure inside the lungs, and the air from outside the body flows into the lungs.



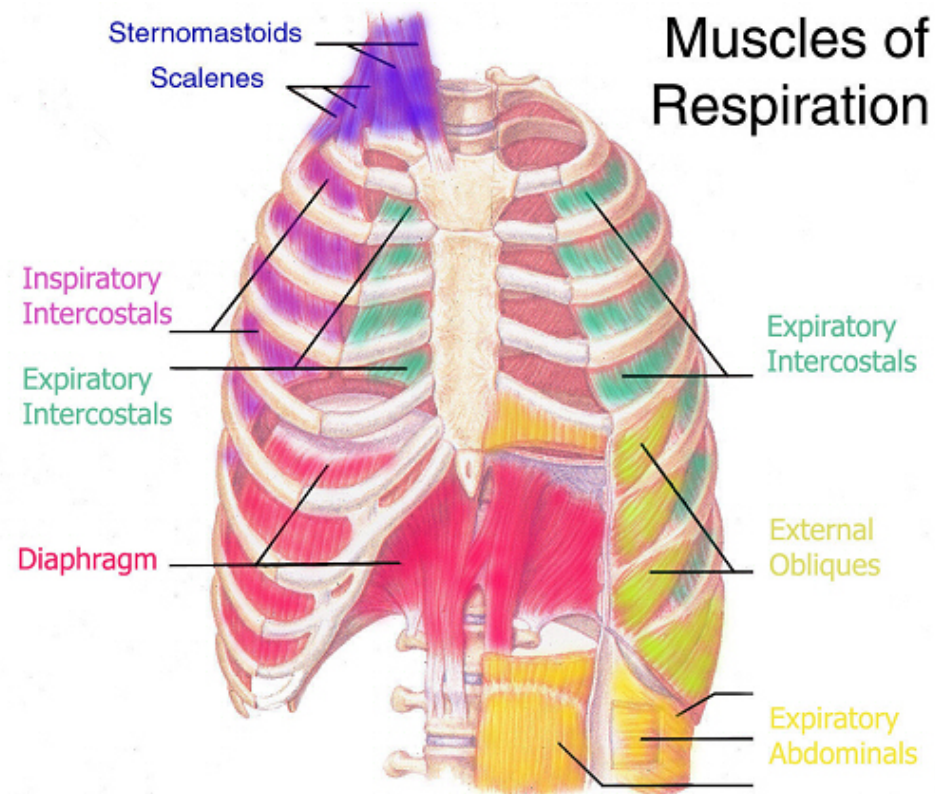
During exhalation, the diaphragm relaxes, decreasing the volume of the chest cavity. The pressure increases in the lungs, forcing air out of the lungs.

- **Inspiration**
- Diaphragm & external intercostal muscles
- Flattens with inspiration, pulling lungs downward and increasing volume within the thoracic cavity
- Negative air pressure created which allows lungs to be filled with air

- **Expiration**
- Normally is passive without muscular effort

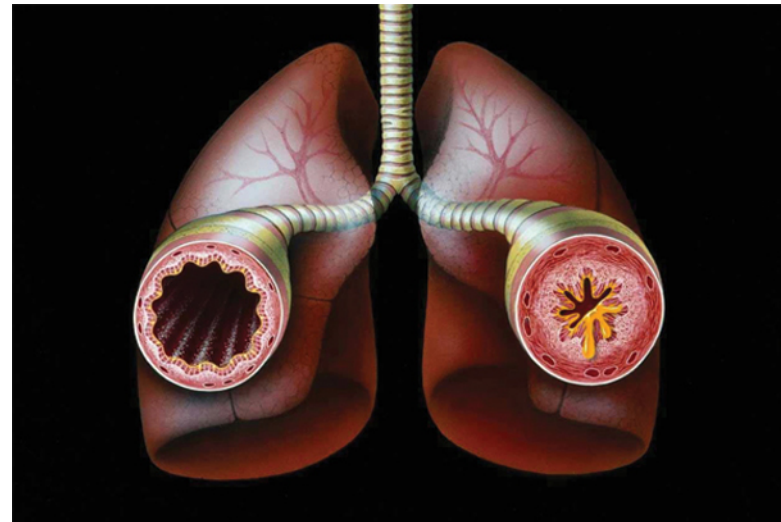
PHYSIOLOGY

- Accessory muscles include sternocleidomastoid, scalene, abdominal, and internal intercostal



PHYSIOLOGY

- **Resistance to airflow**
- Diameter of airway decreased therefore increasing resistance

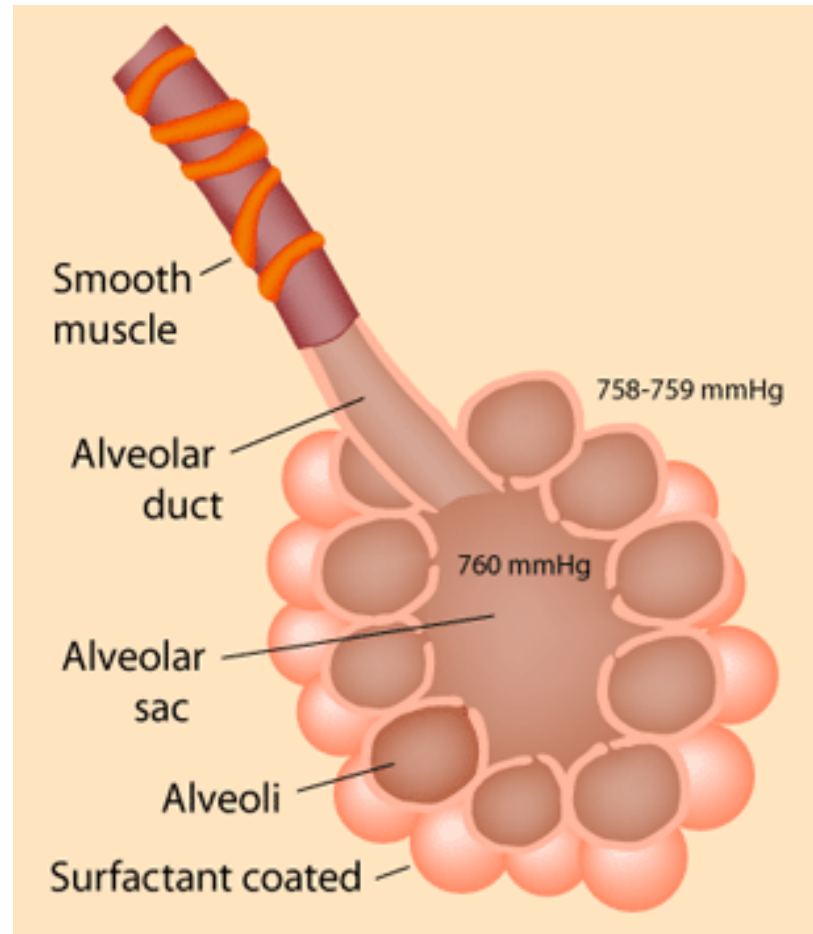


- Normally low but increases with swelling, obstruction with mucus, and bronchial muscle spasm

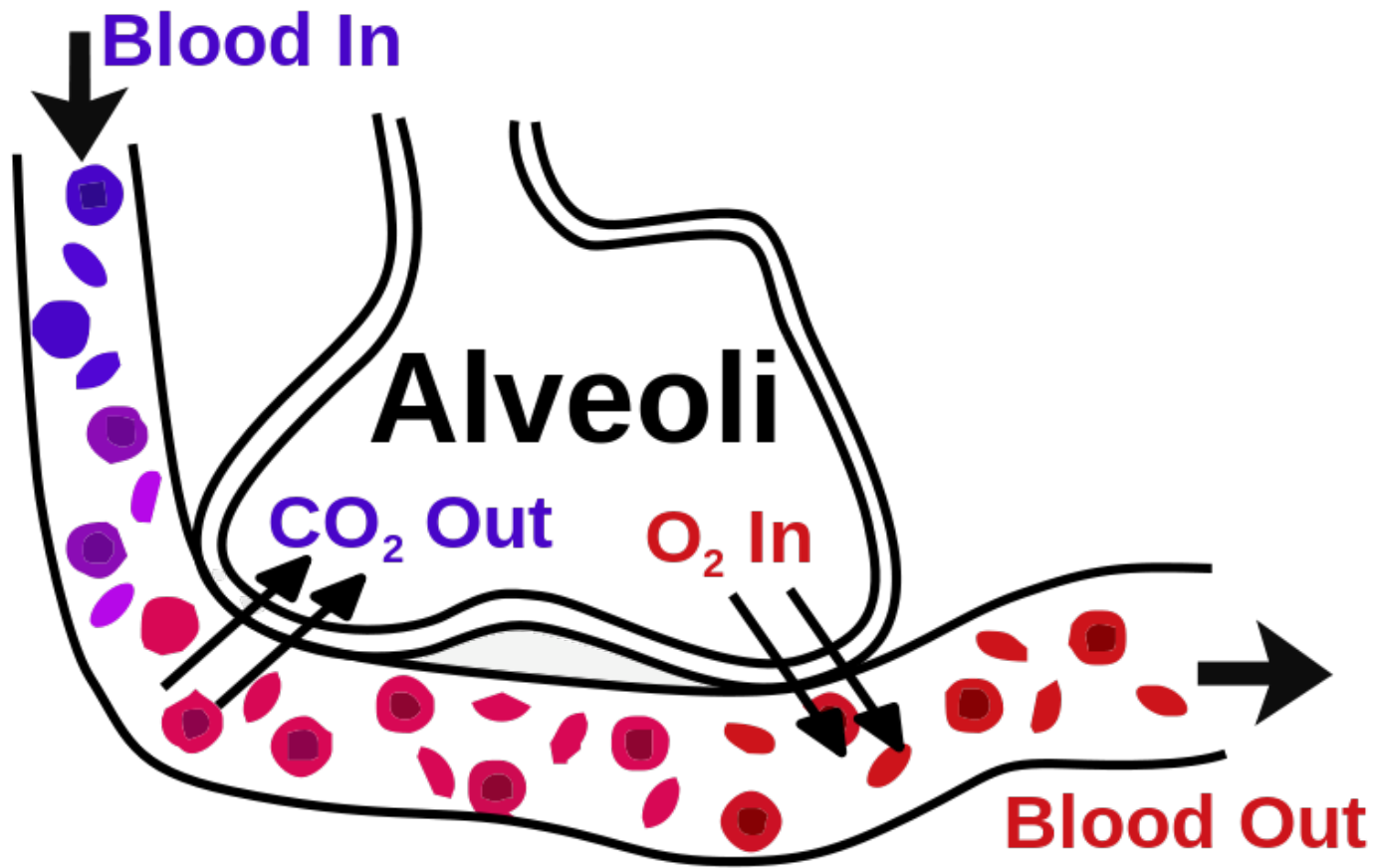
- **Elasticity and compliance of the lungs and chest wall**
- Elasticity-tendency to return to original shape after being stretched
- Compliance-a measure of how easily the lungs and chest wall can be stretched
- Disease states can alter the compliance/elasticity balance

- **Alveolar surface tension**
- As surface tension increases, expansion of lungs is more difficult
 - Surfactant decreases alveolar surface tension; without it alveoli would collapse

PHYSIOLOGY

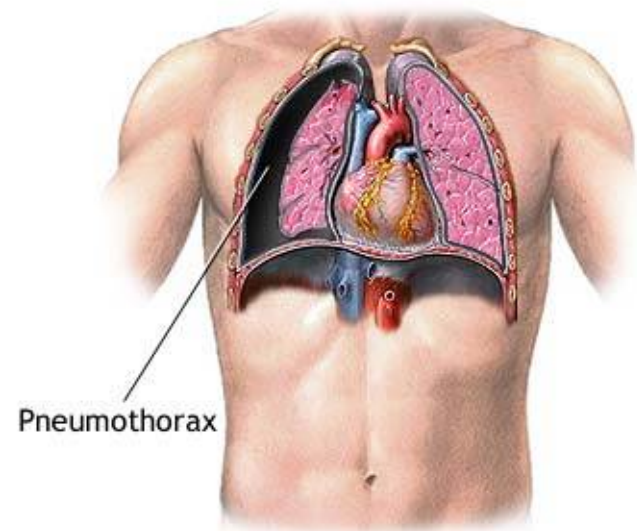


PHYSIOLOGY

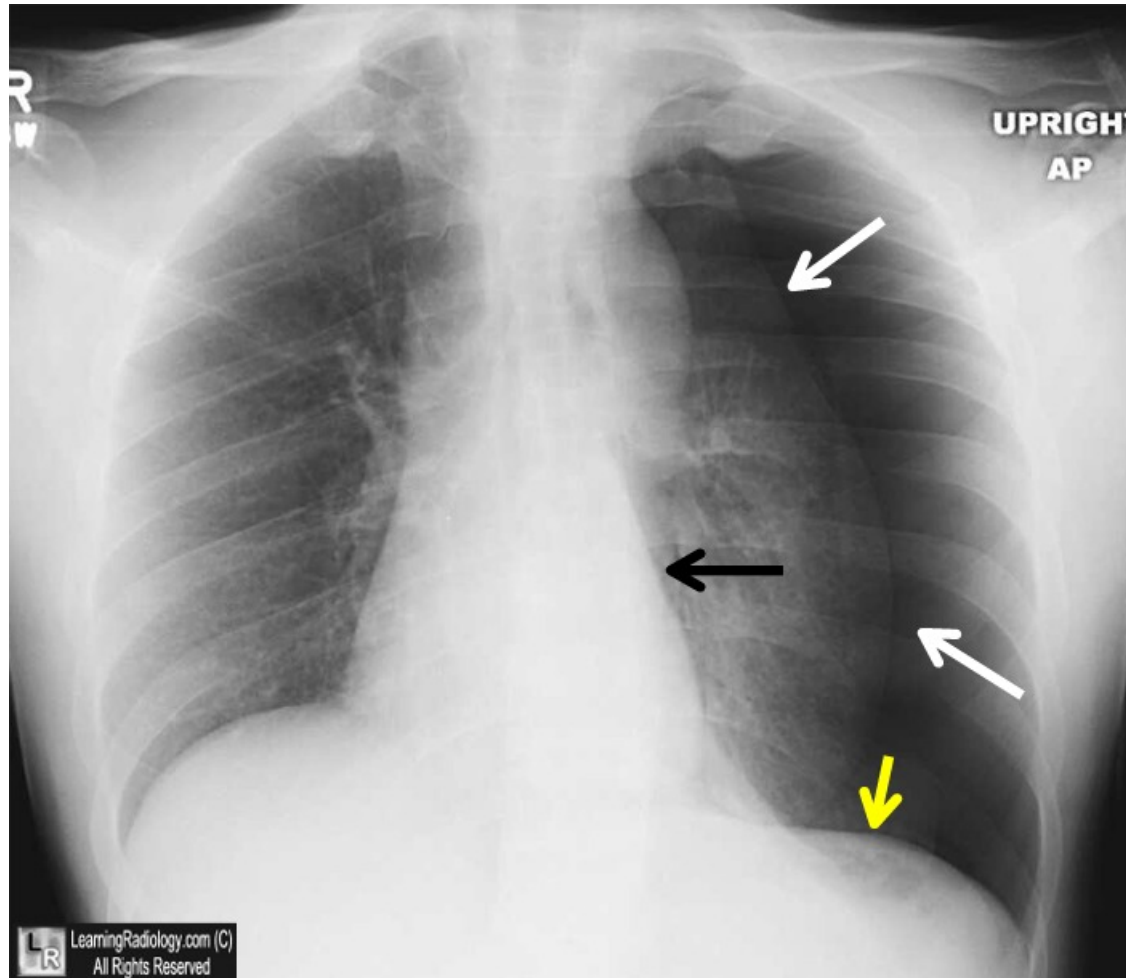


PNEUMOTHORAX

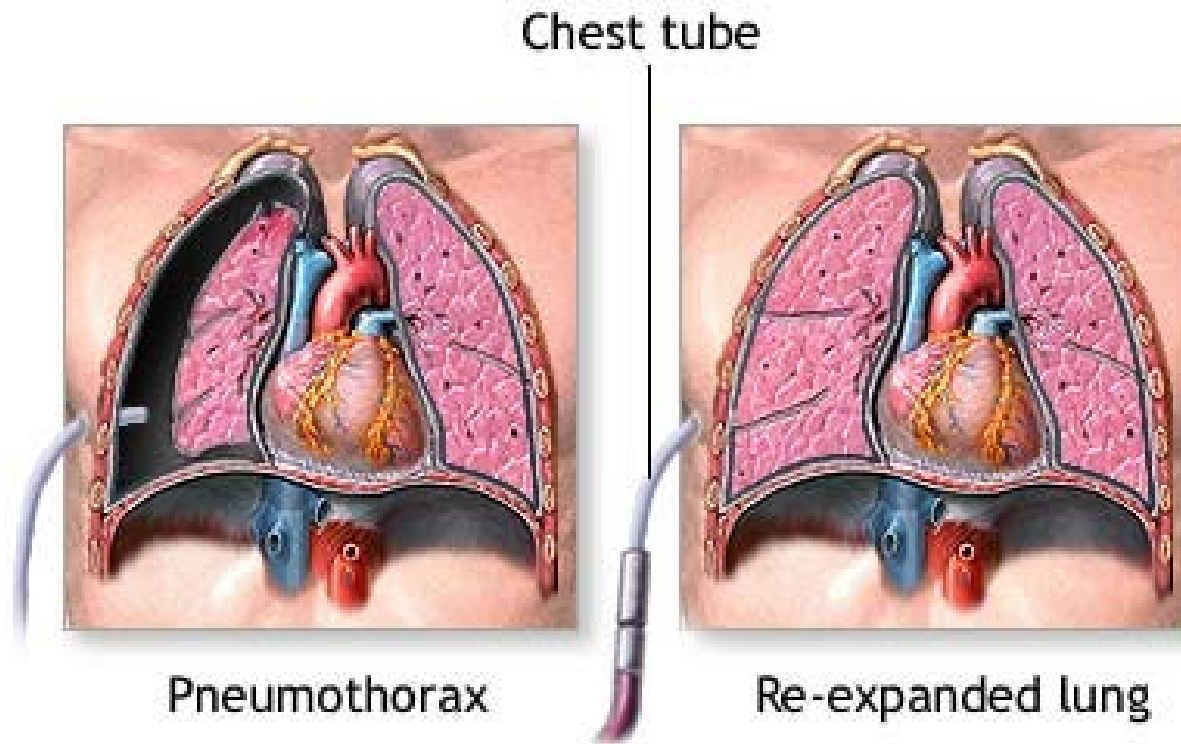
- Collection of air in the pleural space, putting pressure on lung and causing it to collapse
- Causes include trauma, infection, spontaneous (bleb rupture)



PNEUMOTHORAX

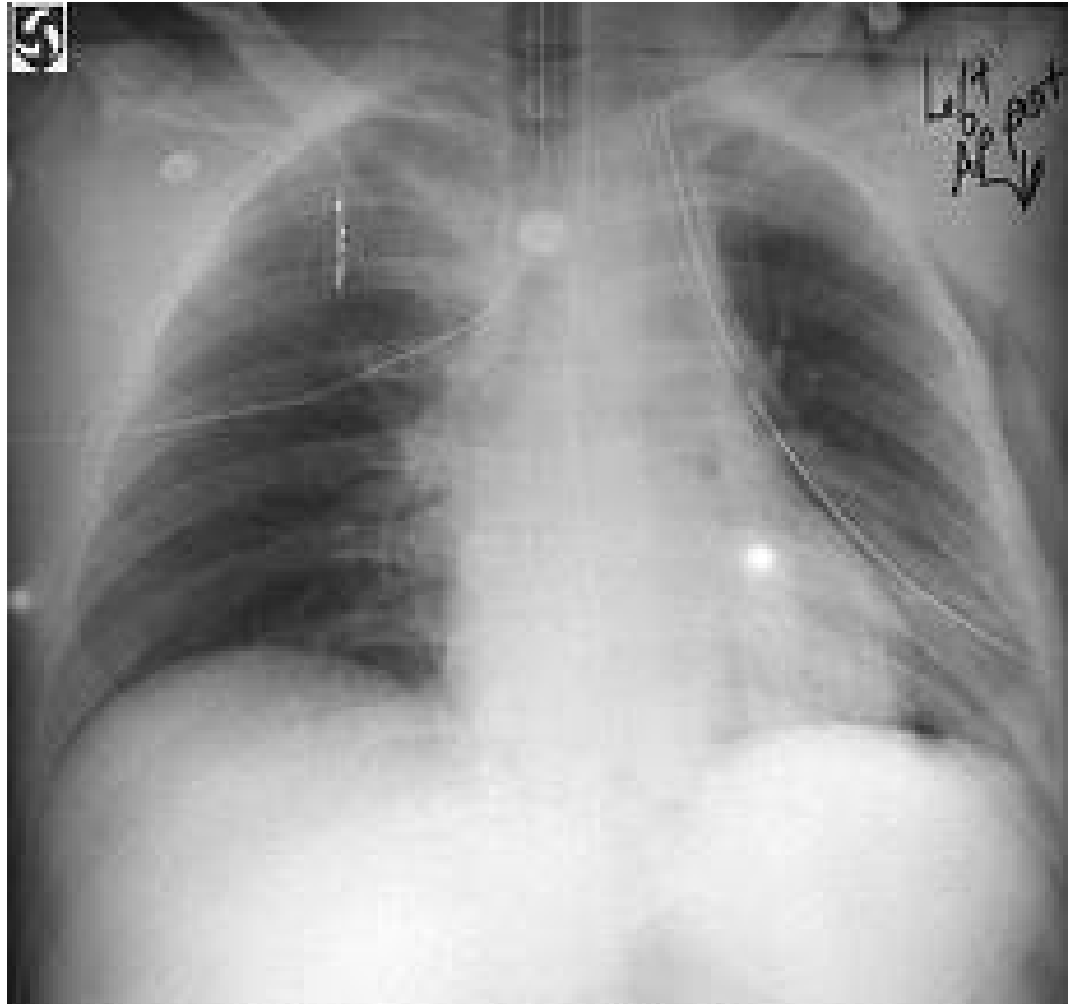


PNEUMOTHORAX



ADAM.

PNEUMOTHORAX



COMMON SIGNS AND SYMPTOMS

- **Asphyxia**
 - Severe decrease in blood O₂ that leads to loss of consciousness/death
- **Cough**
 - Reflex to dislodge and expectorate secretions/foreign body
- **Dyspnea**
 - Difficulty breathing
- **Epistaxis**
 - Nose bleed

SIGNS AND SYMPTOMS

- **Hemoptysis**
 - Coughing up blood
- **Hyperventilation**
 - Deep and fast ventilation, resulting in low blood PaCO₂
 - Low BP, tingling, numbness in feet/hands/lips, fainting
- **Hypoxemia**
 - Abnormally low blood O₂

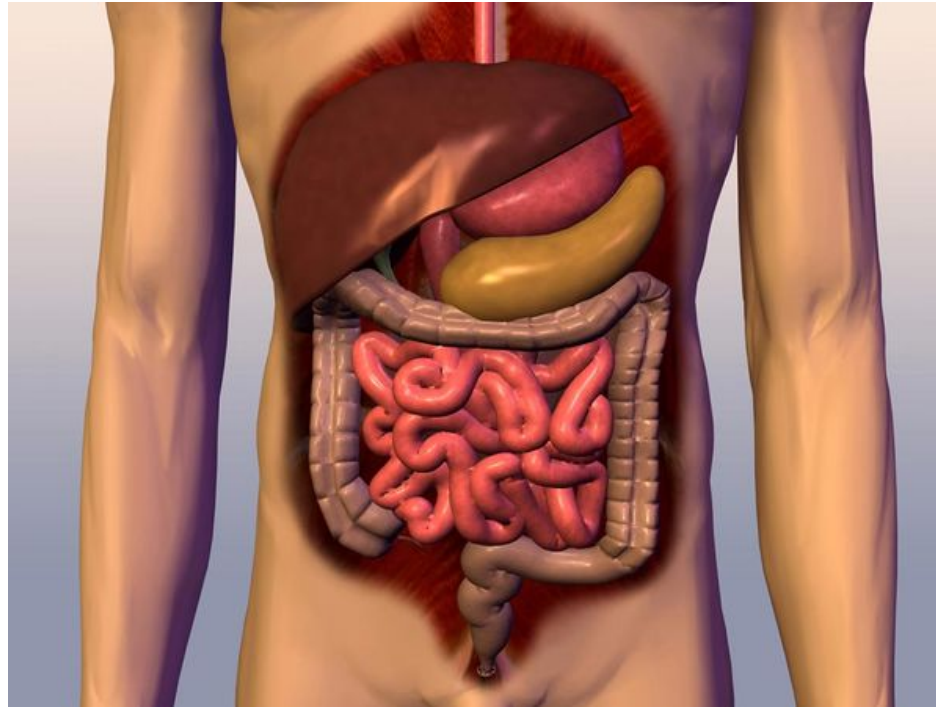
SIGNS AND SYMPTOMS

- **Intercostal pain**
 - Pain in rib area/muscles made worse by coughing, sneezing, breathing
- **Pleurodynia**
 - Source of pain is pleura, made worse by coughing, sneezing, breathing
- **Shortness of Breath (SOB)**
 - Need for air, breathlessness
 - Orthopnea-when lying flat

- **Respiratory Arrest**

- Sudden cessation of respiration caused by airway obstruction, decreased ventilation effort (CNS disorder, poisoning, drugs etc.), or weakness of respiratory muscles (infection, neuromuscular disorders)

DIGESTIVE SYSTEM



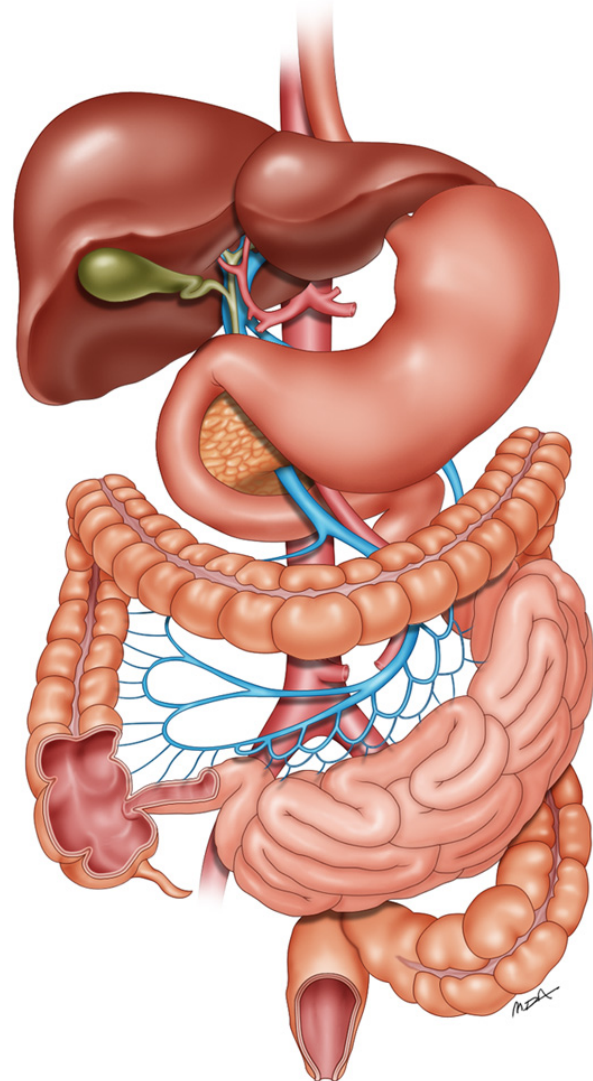
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FOR PRESENTATION PURPOSES ONLY

DIGESTIVE SYSTEM

- Gastrointestinal tract (GI tract)
- Accessory organs of digestion



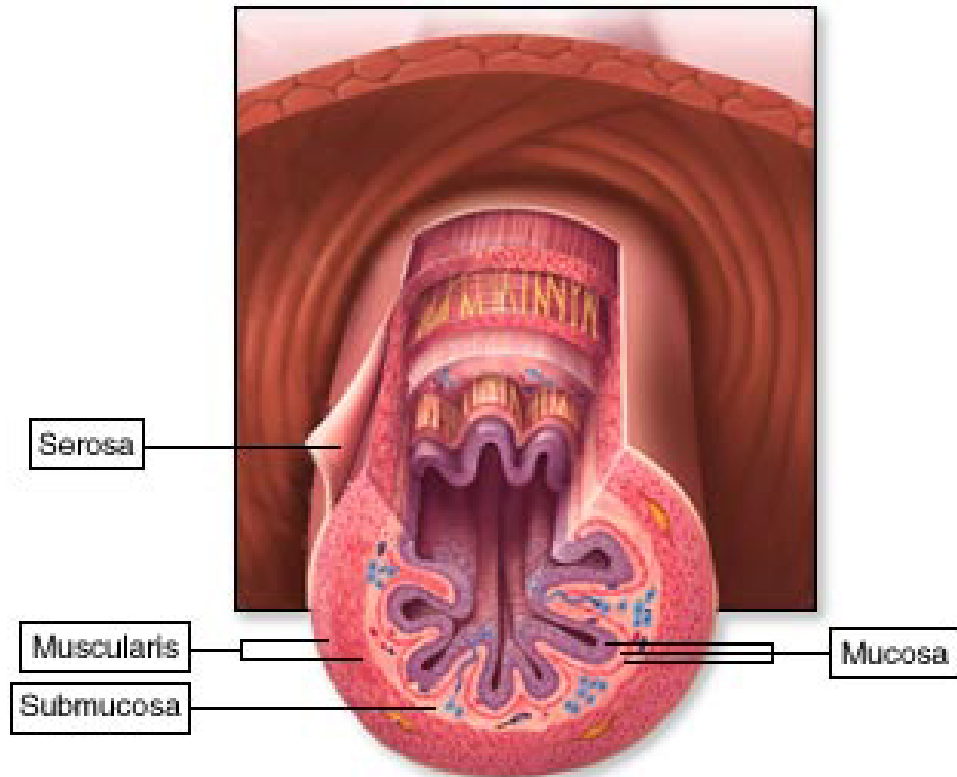
FUNCTION

- Break down food
- Prepare it for uptake by the cells
- Supply body with water
- Eliminate waste

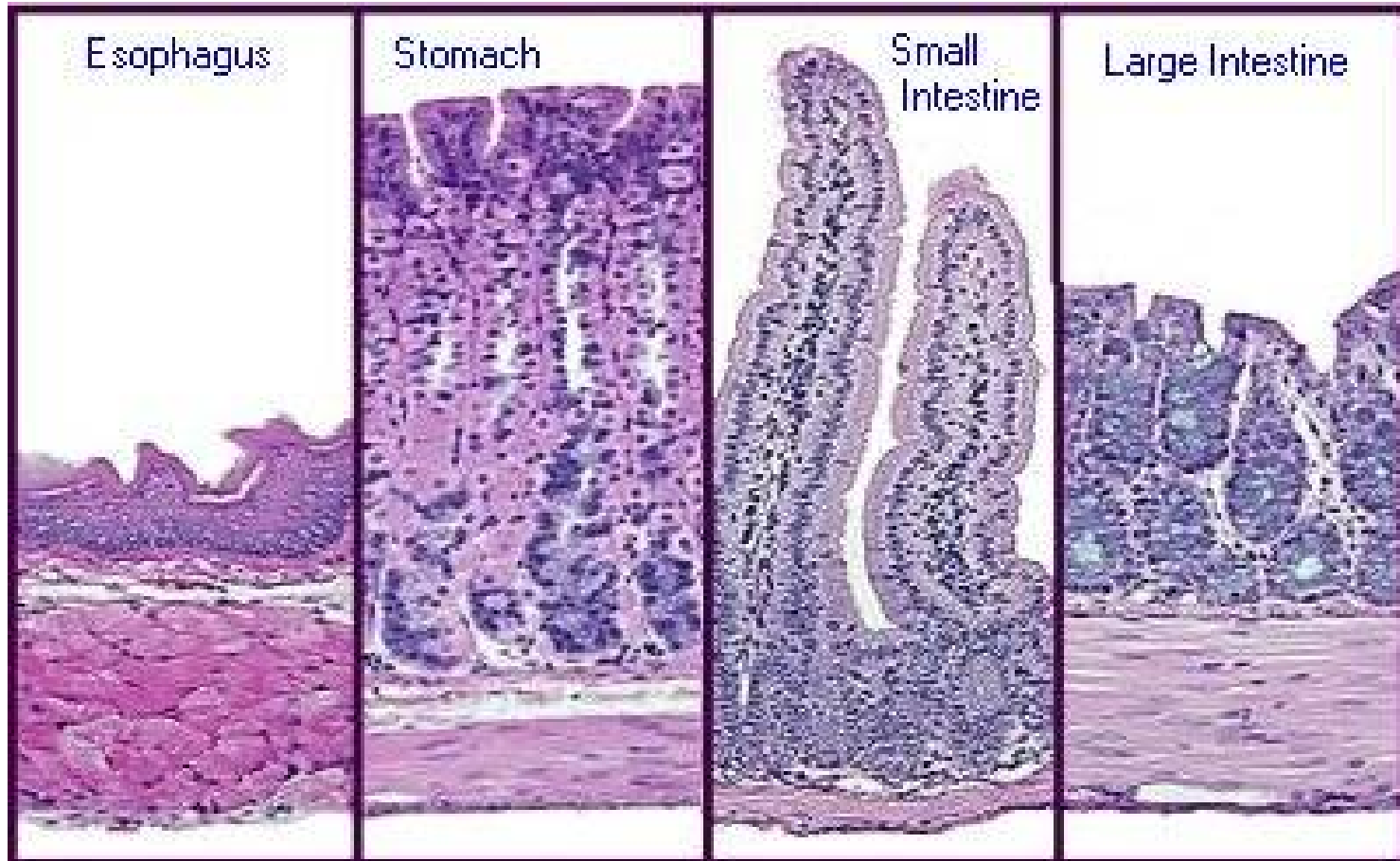
- Specialized types performing specific functions. Examples include:
 - Mucous
 - Serous
 - Enterocytes
 - Endocrine
 - Parietal
 - Hepatocytes
 - Acinar cells

TISSUES OF DIGESTIVE TRACT

- 4 layers of tissue that line the digestive canal
 - Mucosa
 - Submucosa
 - Muscularis
 - Serosa



TISSUES OF DIGESTIVE TRACT



MUCOSA

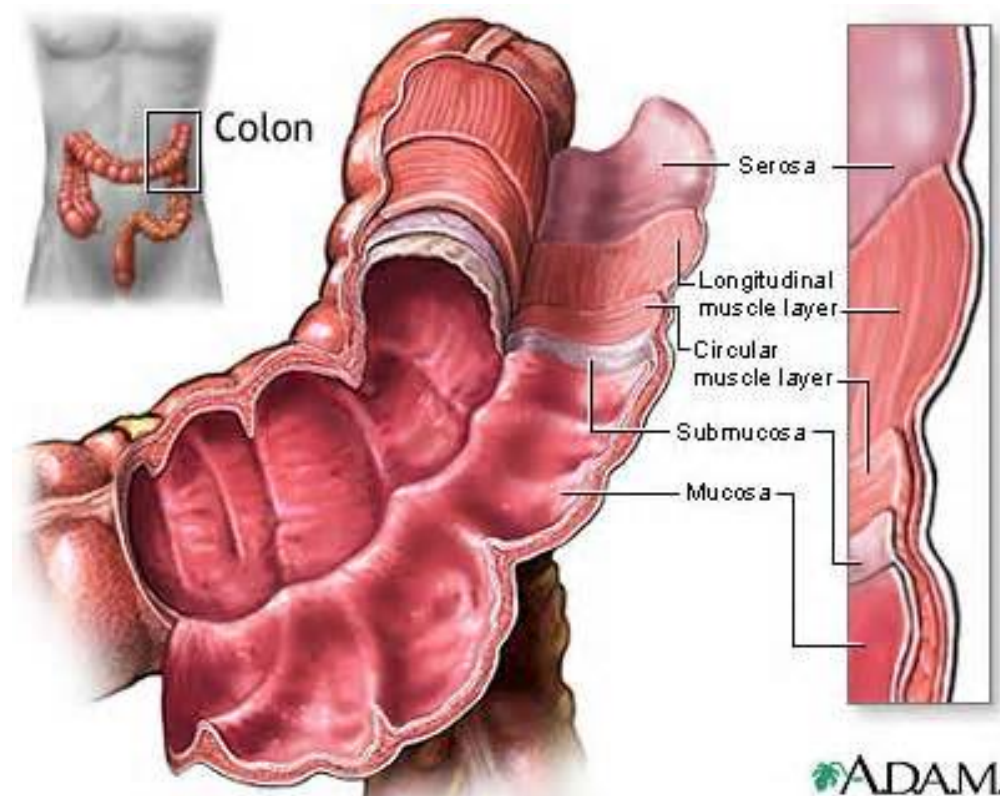
- Mucosal epithelium contain protrusions (villi) and depressions (gastric pits/intestinal crypts)
- Increase absorptive surface area; site of glandular secretions

SUBMUCOSA

- Contains blood vessels, lymph vessels, and nerves supplying the mucosa

MUSCULARIS

- Responsible for peristalsis and the churning action of the stomach that aids in digestion



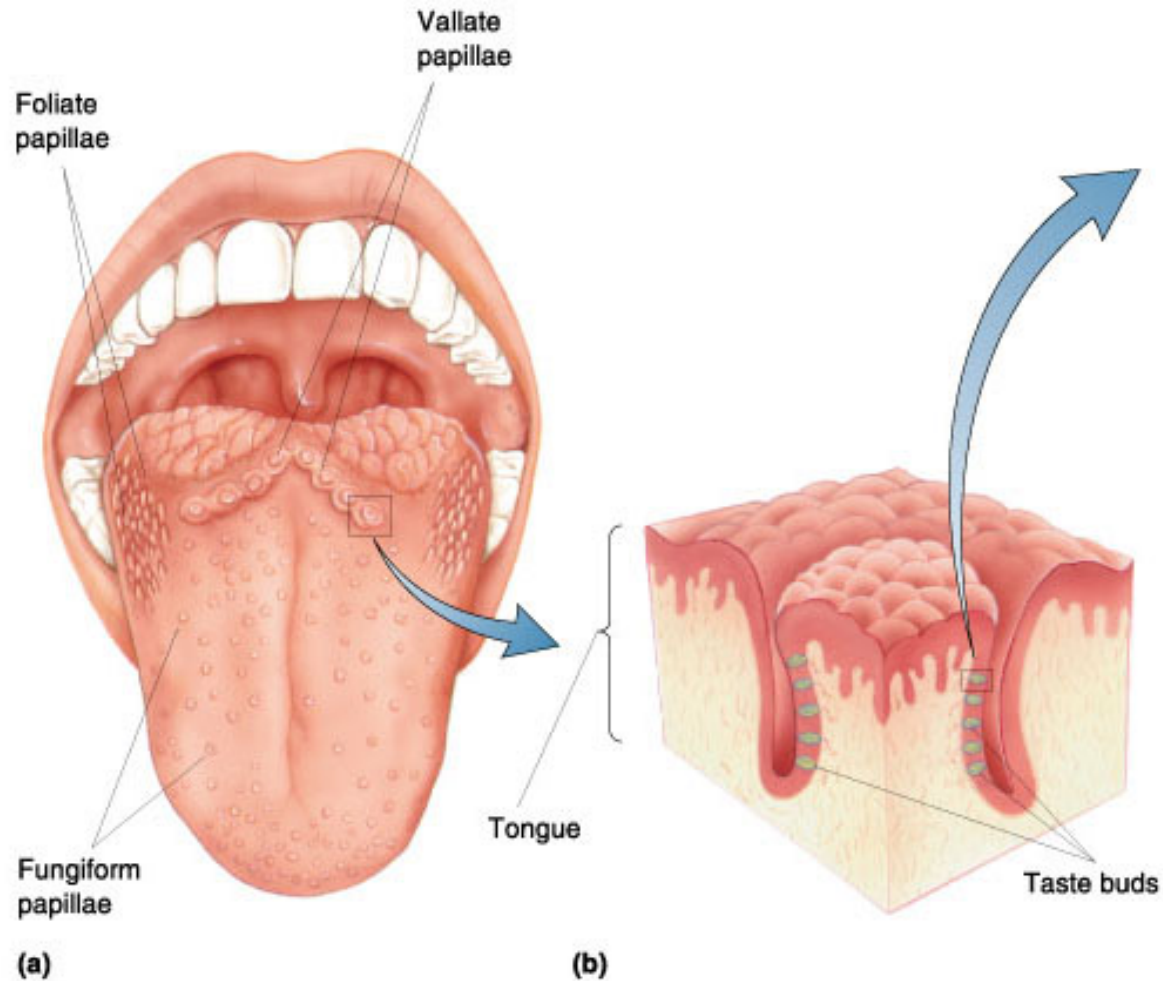
SEROSA

- Outermost, smooth membrane lining the GI tract
- Envelopes the organs of the abdominal and pelvic cavity
- Called adventitia in areas where it is attached to surrounding tissue

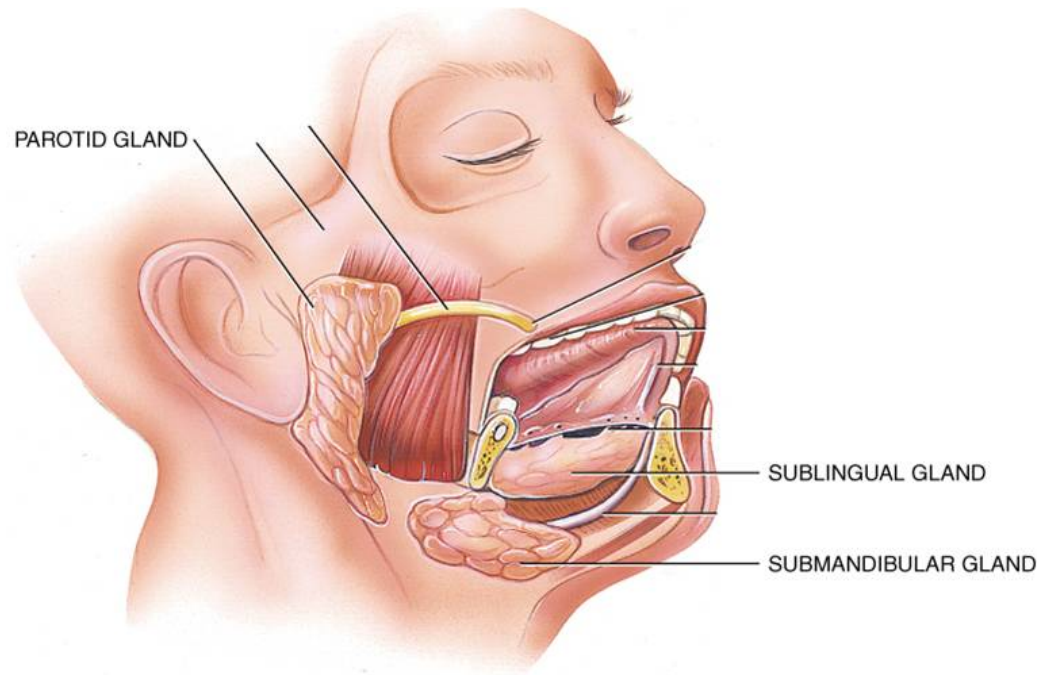
ORGANS AND FUNCTIONS

- Tongue
- Salivary Glands
- Esophagus
- Stomach
- Small Intestine
- Large Intestine
- Liver
- Pancreas
- Gall bladder

ORAL CAVITY



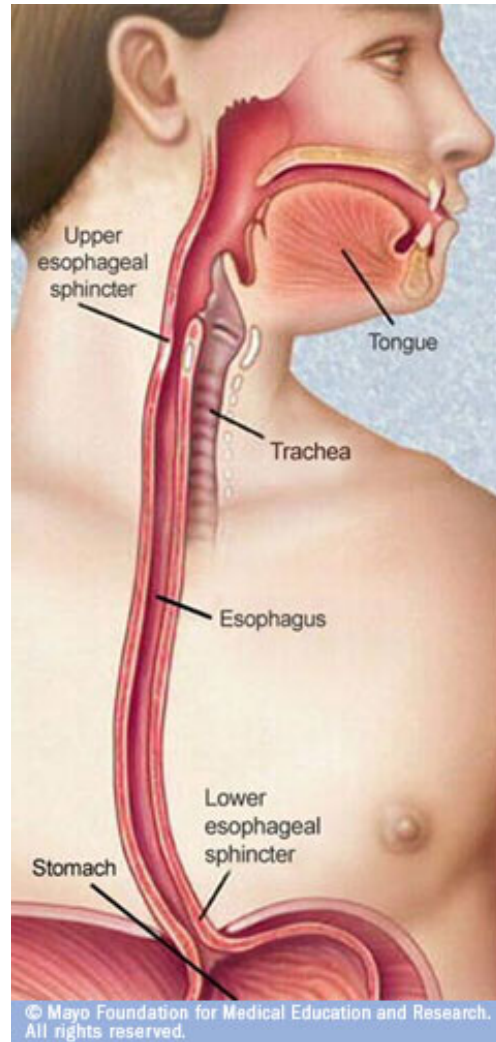
ORAL CAVITY



(a) Location of salivary glands

Submandibular, sublingual, and parotid glands

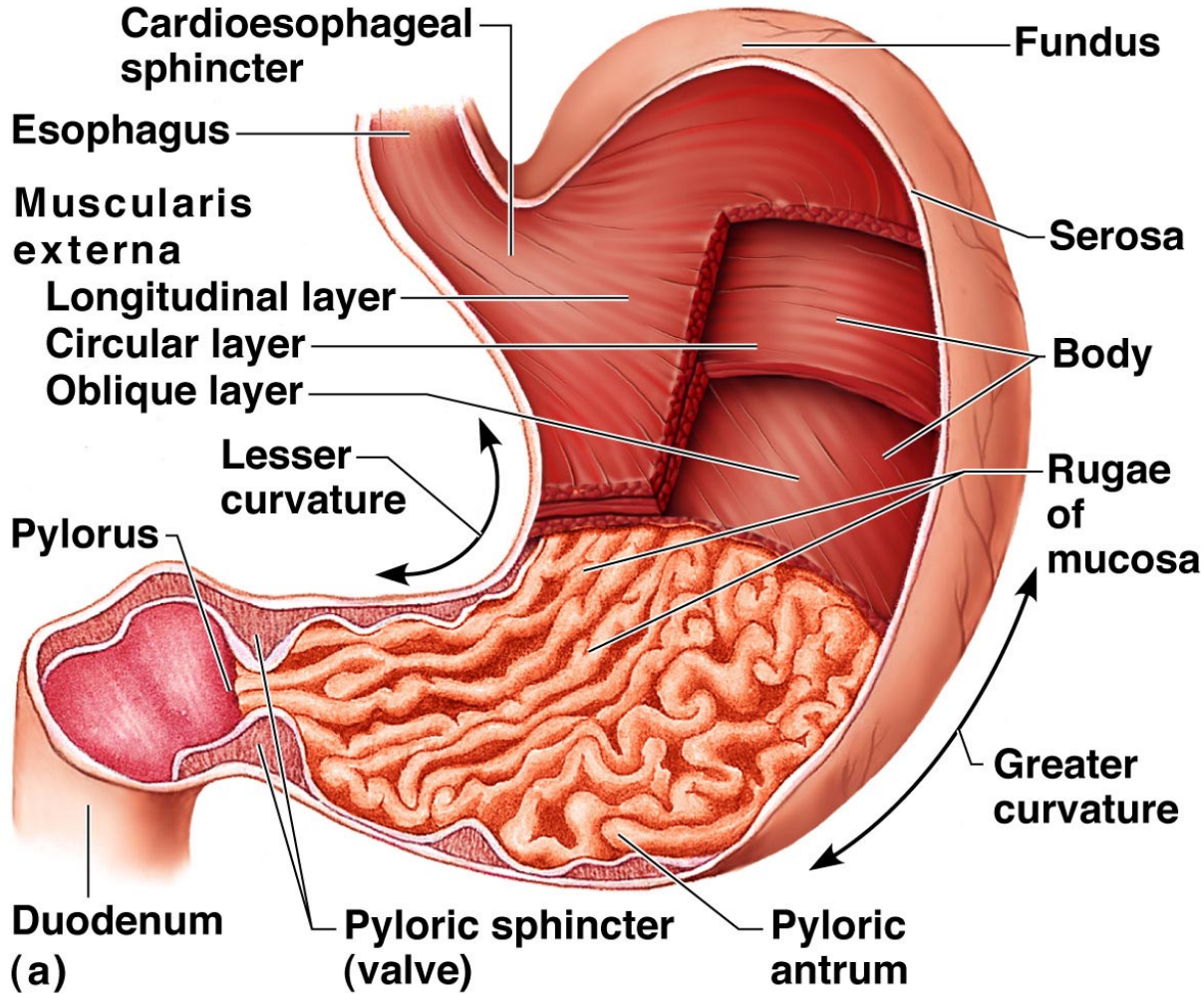
ESOPHAGUS



ESOPHAGUS

- Upper esophageal sphincter-prevents air from entering esophagus during respiration
- Lower esophageal sphincter-prevents food in the stomach from re-entering the esophagus

STOMACH



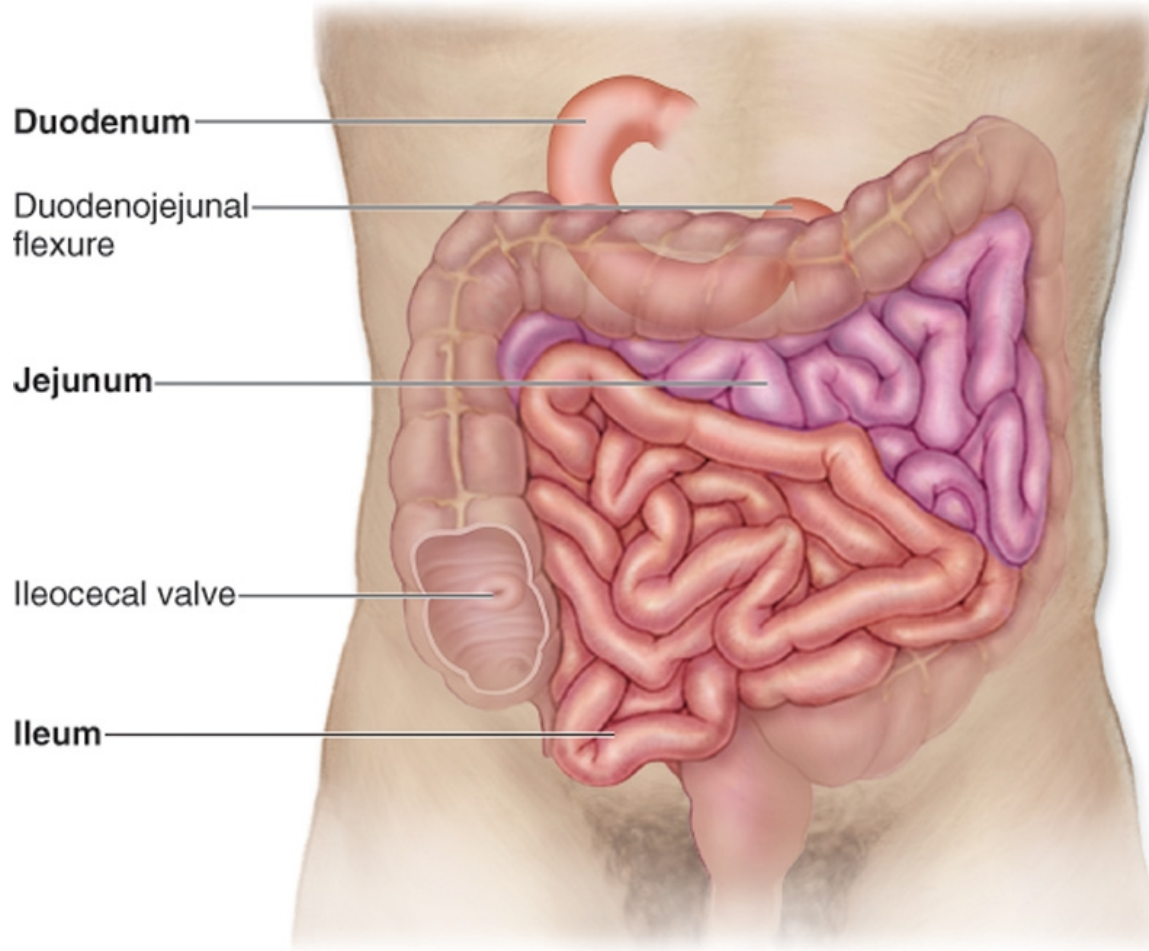
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STOMACH

- Chyme
- Digestive Juices
 - Mucus-protects stomach lining
 - Hydrochloric Acid (HCl)-kills microorganisms that have been swallowed
 - Pepsin-breaks down proteins
 - Intrinsic factor-Vitamin B12 absorption

SMALL INTESTINE

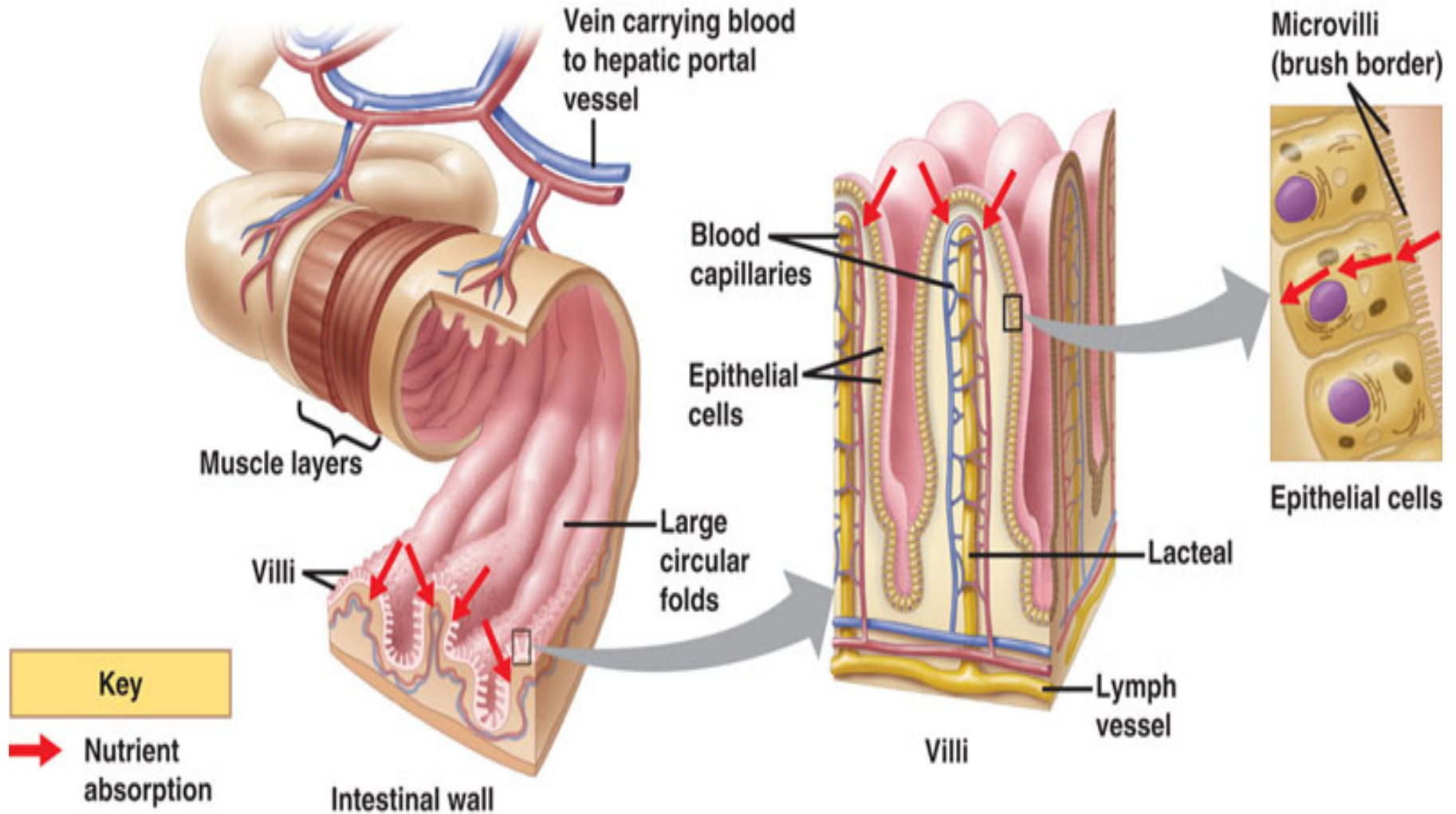
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SMALL INTESTINE

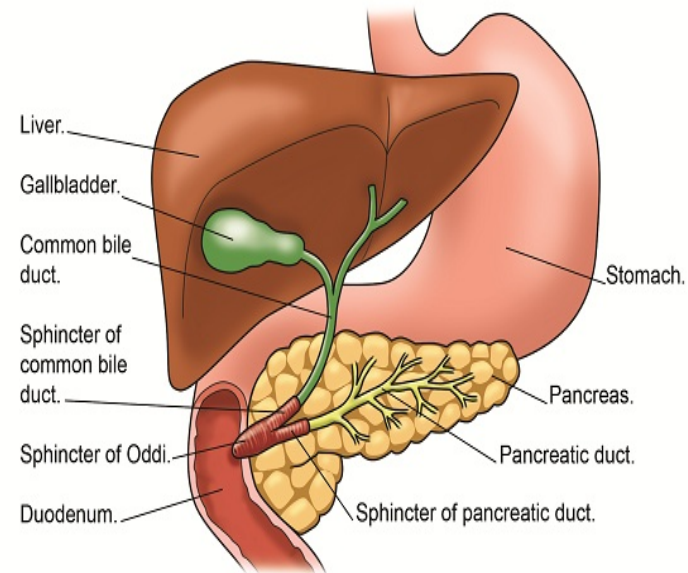
- Site of absorption of body nutrients-
sugars, fats, amino acids, water
electrolytes, vitamins
- Mucosal folds slow the passage of food
and allow for greater absorption
- Villi and microvilli

SMALL INTESTINE



SMALL INTESTINE

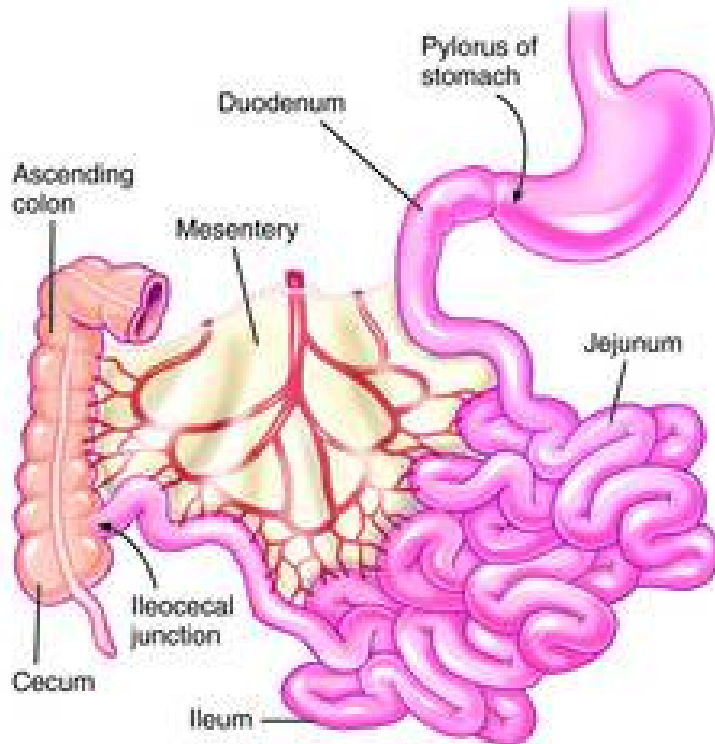
- Duodenum
 - Begins breakdown of chyme; mixes with bile from gall bladder and enzymes from pancreas
 - Sphincter of Oddi



SMALL INTESTINE

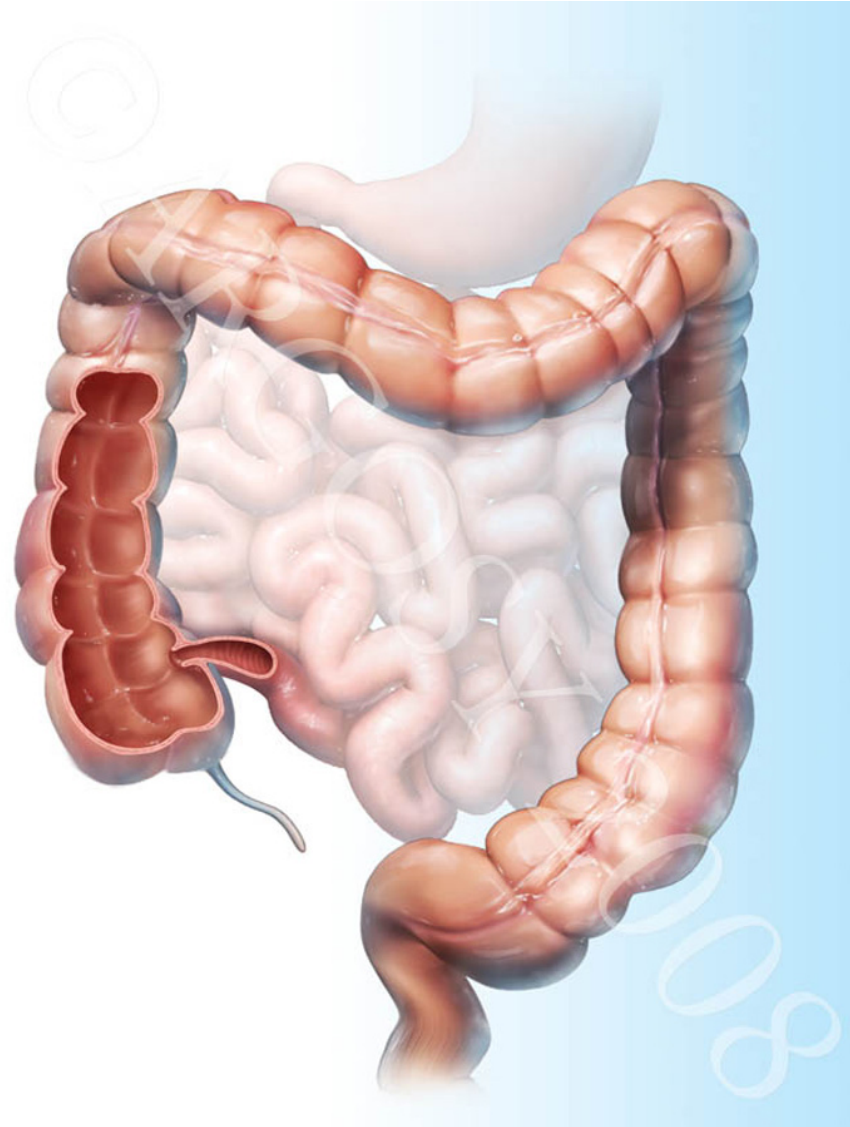
- Jejunum
 - Complete breakdown of chyme
- Ileum
 - *Absorb* nutrients and bile
 - Ileocecal valve-controls movement of digested food into the large intestine
 - Mesentery

MESENTERY

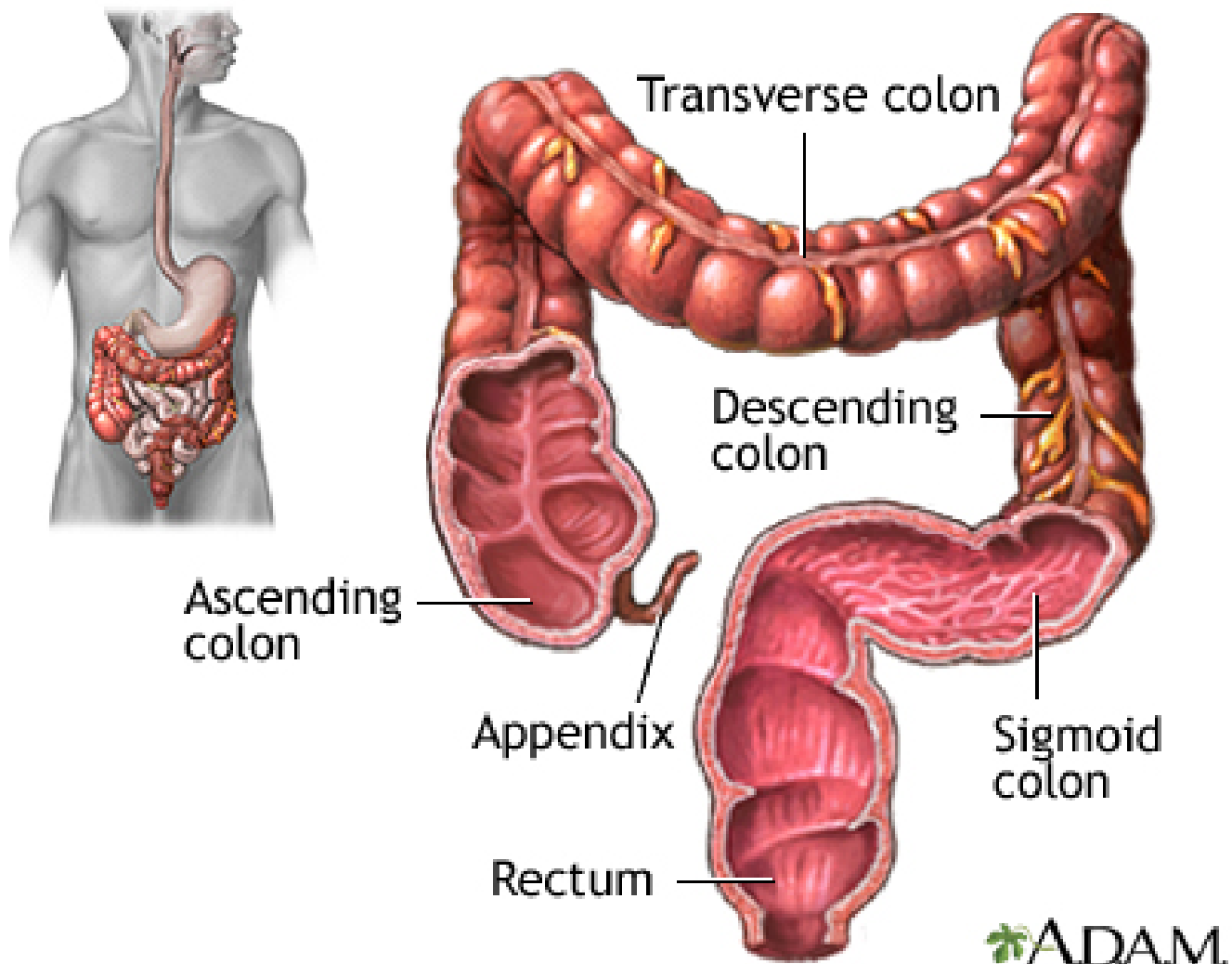


LARGE INTESTINE

- Cecum
- Appendix
- Colon
- Rectum
- Anal canal



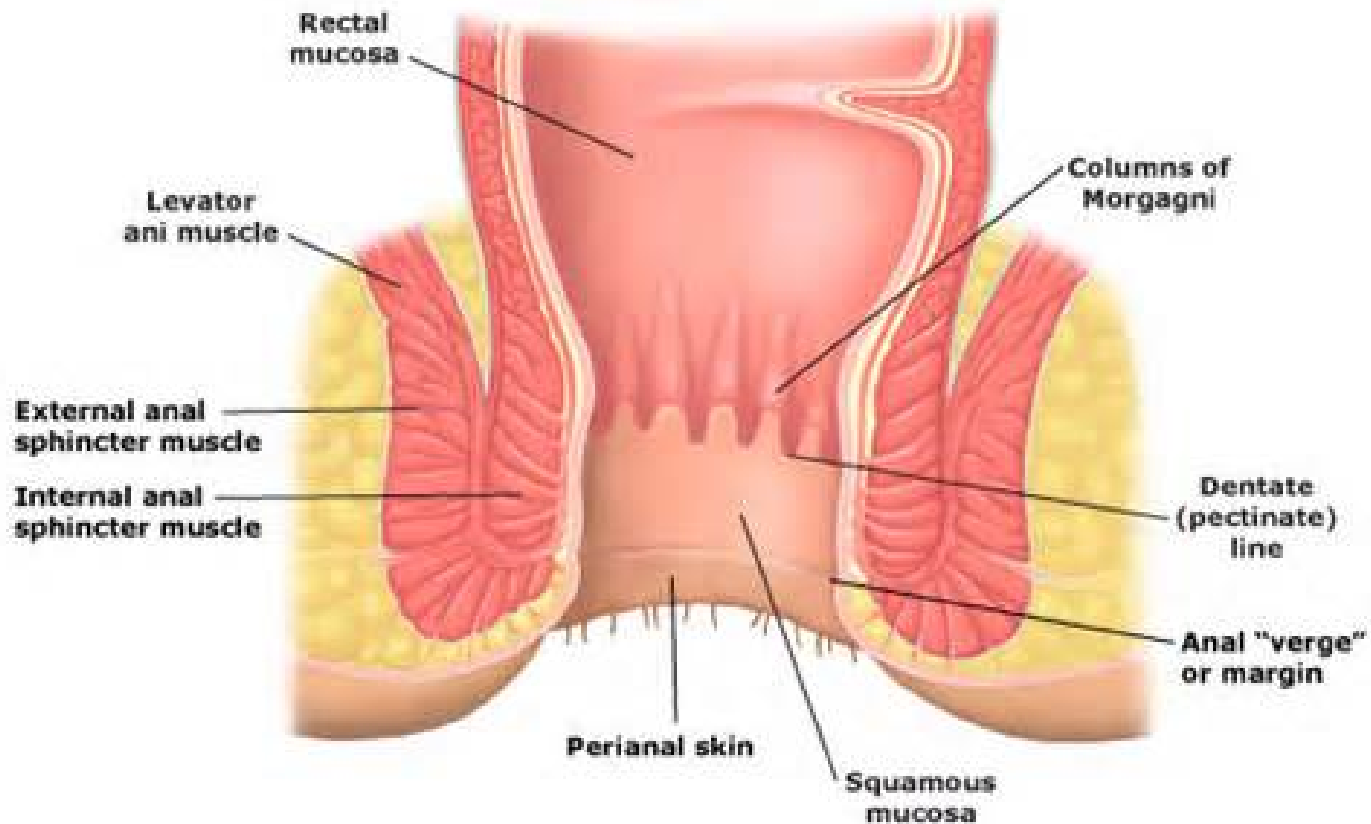
LARGE INTESTINE



LARGE INTESTINE

- Continued absorption of water and electrolytes for use by the body
- Solid waste products that remain form feces
- Defecation

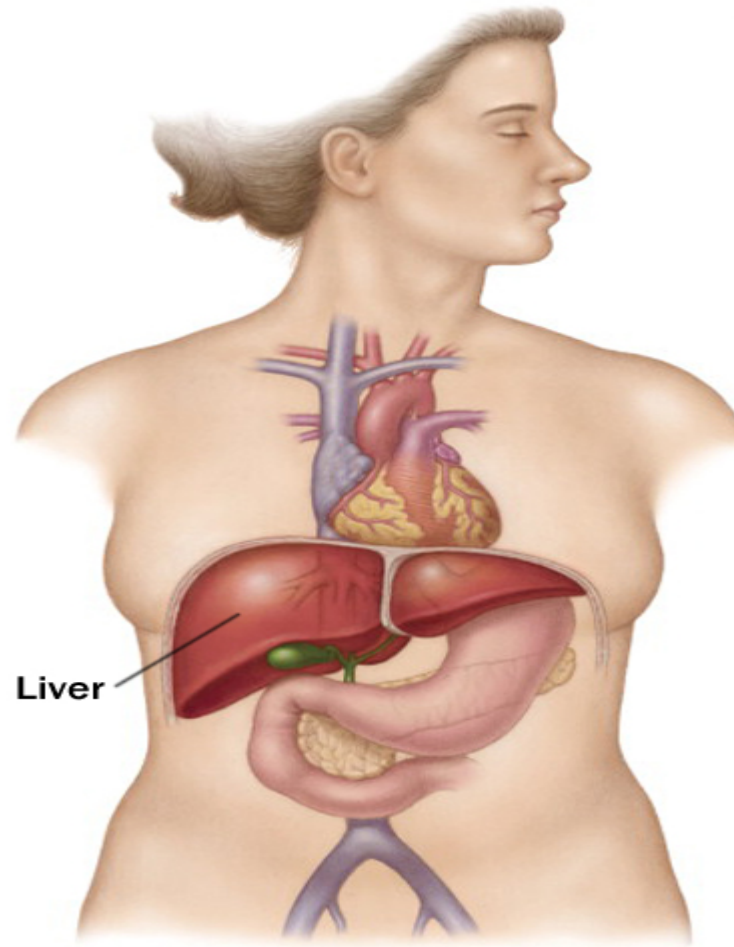
LARGE INTESTINE





"Well, you appear to be free of infection, but your colonoscopy video has gone viral"

LIVER

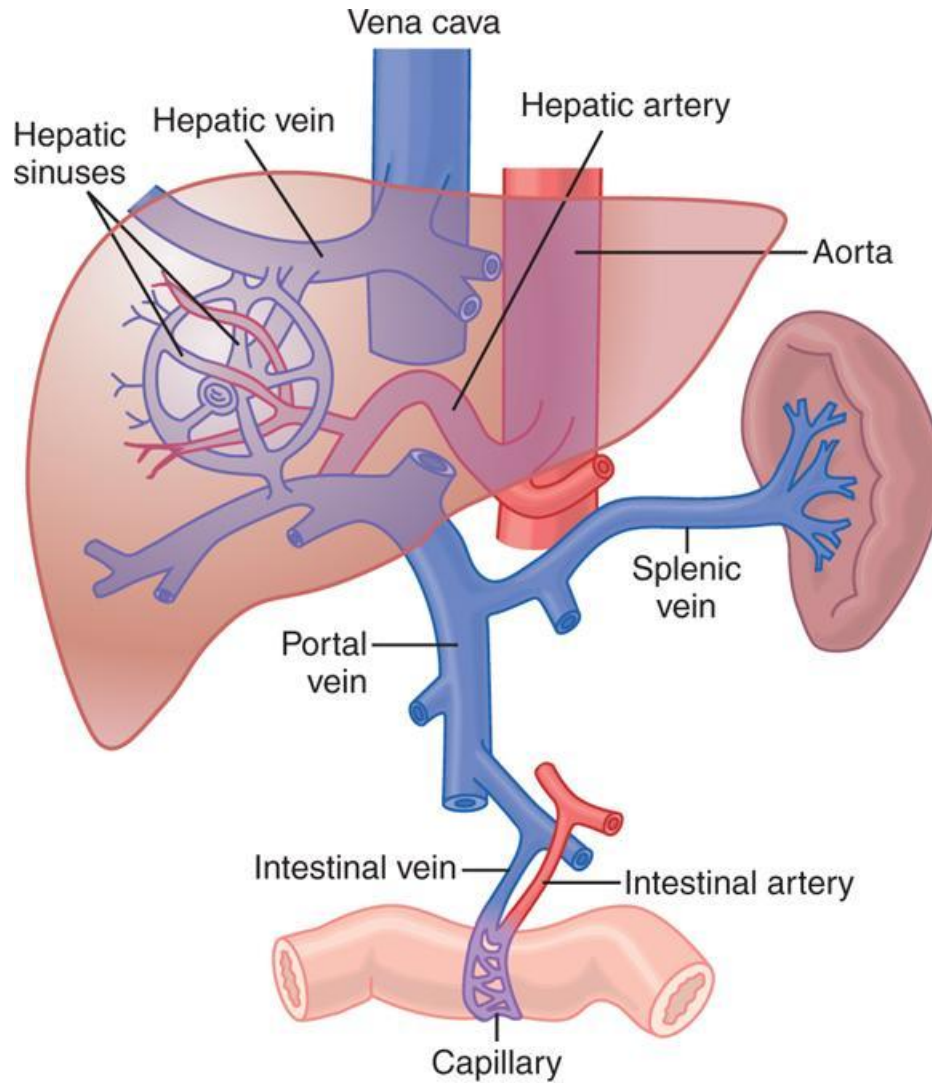


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LIVER

- Main job is filtering of blood coming from the digestive tract
- Detoxifies chemicals and metabolizes drugs
- Manufactures proteins-albumin, proteins involved in blood clotting
- Hepatocytes-functional units of liver

LIVER CIRCULATION

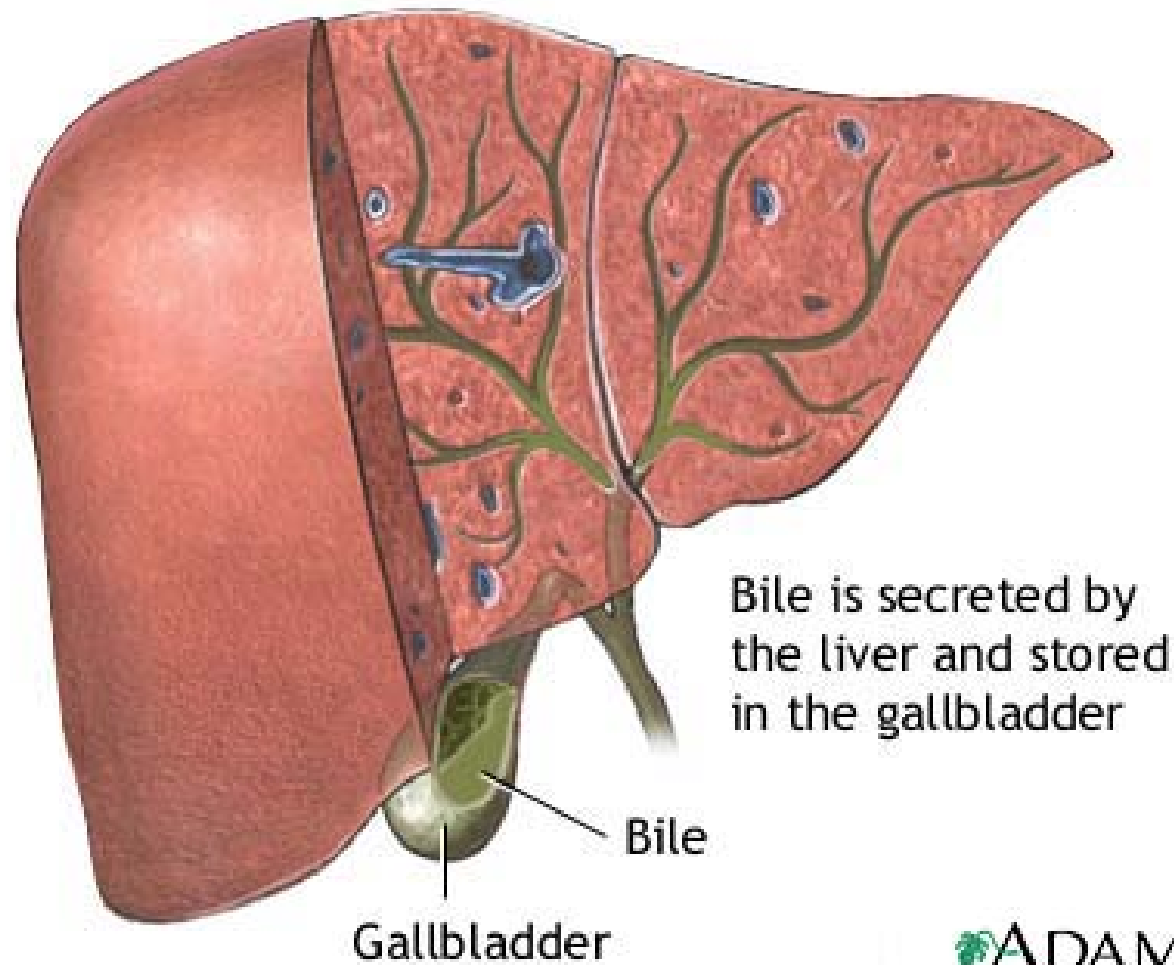


LIVER CIRCULATION

- Perfused from both **arterial** and **venous** blood supplies
- Hepatic artery
- Portal vein

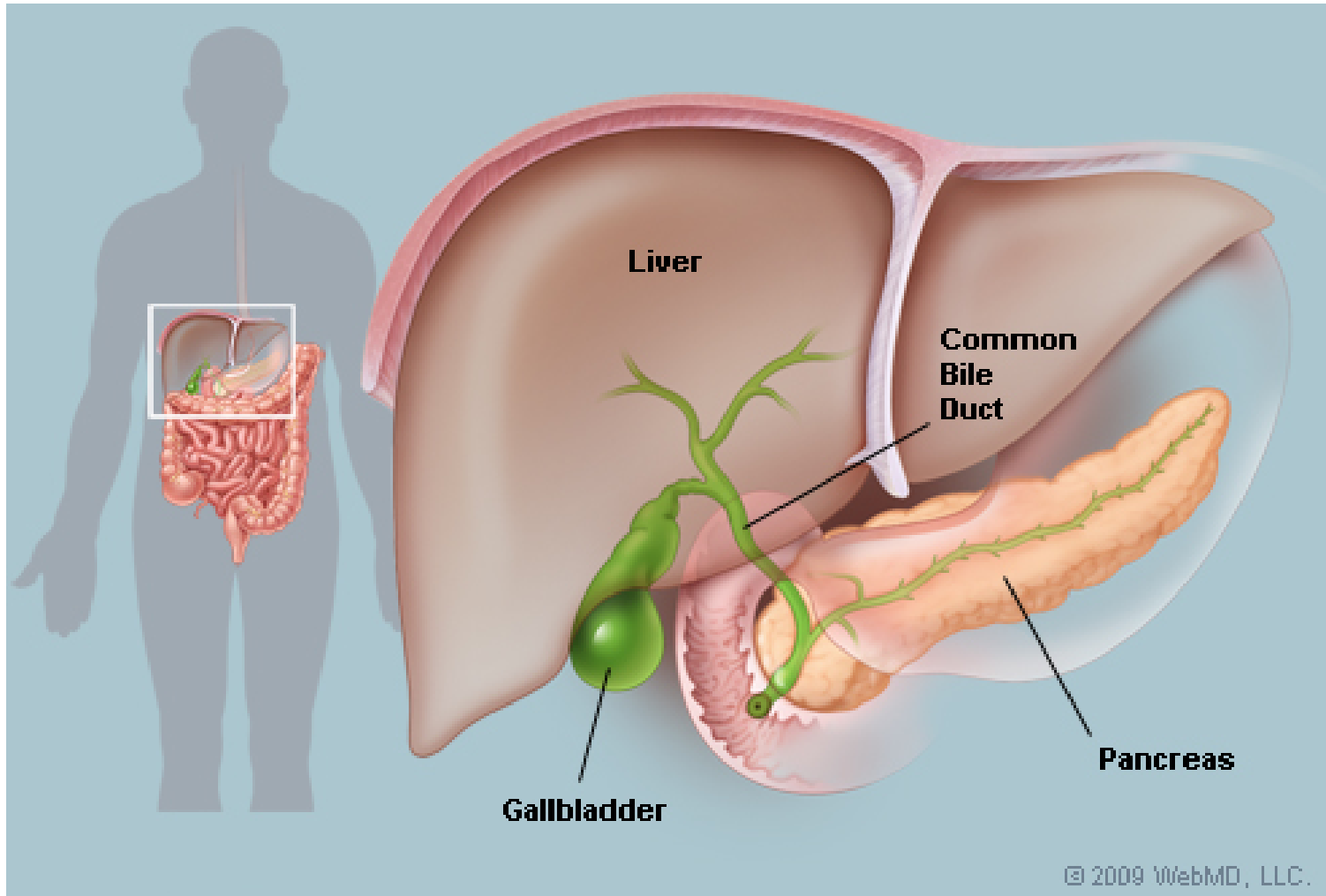
- Blood leaves via hepatic vein, into the inferior vena cava

LIVER



ADAM.

GALL BLADDER



GALLBLADDER

- Pear shaped sac-like organ, under R lobe of the liver
- Stores and concentrates bile secreted by the liver
- Stimulated to contract and release bile into the duodenum-neural and hormonal control

PANCREAS

- *Exocrine*-secretes pancreatic juices that neutralize acidic contents in the duodenum and enzymes to breakdown carbohydrates, proteins, and fats
- *Endocrine*-secretes hormones directly into the bloodstream (insulin)

INTEGUMENTARY SYSTEM



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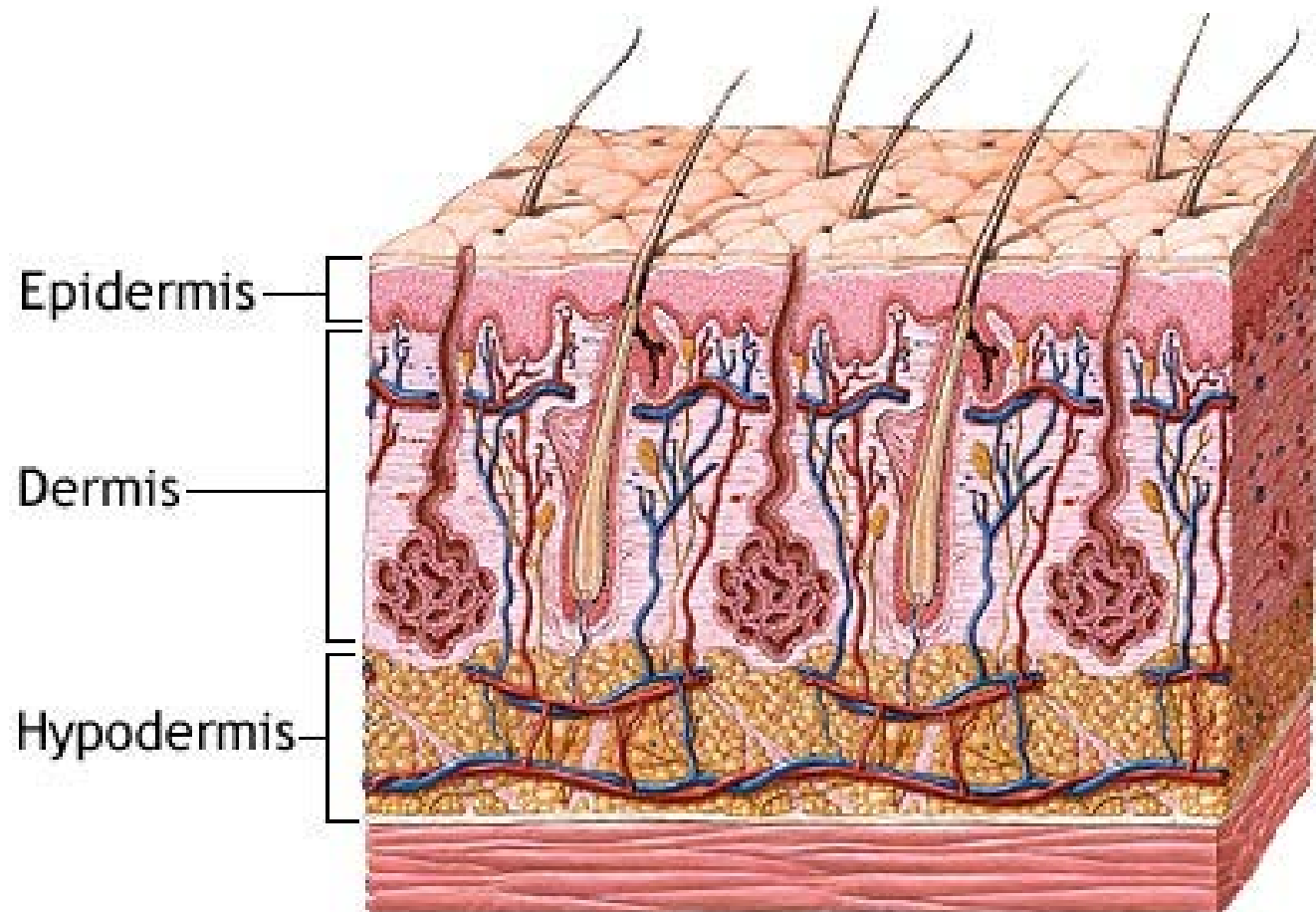
COMPONENTS

- Integumentary system
 - Skin
 - Hair
 - Nails
 - Sebaceous and sweat glands

FUNCTION

- Protective barrier
- Temperature regulation
- Touch and pressure receptors
- Vitamin D
- Largest organ of the body

LAYERS



 ADAM.

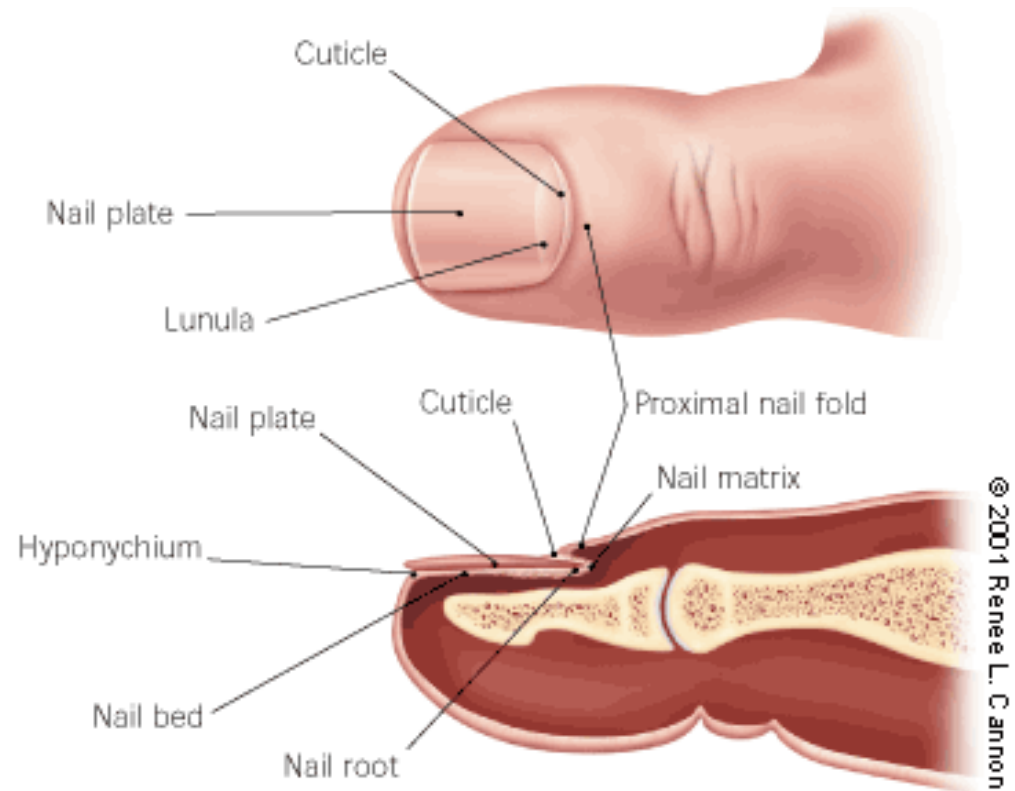
- **Epidermal cells**
- Keratinocytes-keratin
- Melanocyte-pigment
- Langerhans Cells-immune defense
- Merkel Cells-touch receptors and sensory nerve endings

- **Dermal cells**
- Fibroblasts-structural integrity
- Mast Cells-hypersensitivity reactions in skin; histamine
- Macrophages-immune response

- **Hypodermal cells**
- Fat-cushioning layer

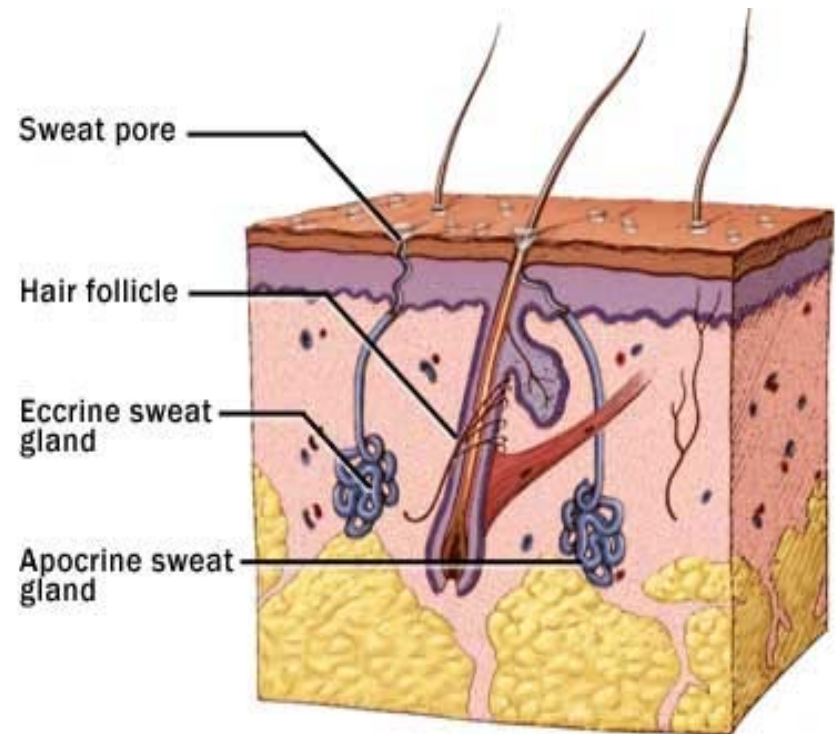
NAILS

- Composed of keratin
- Matrix
- Lunula
- Nail plate
- Paranychium



SKIN GLANDS

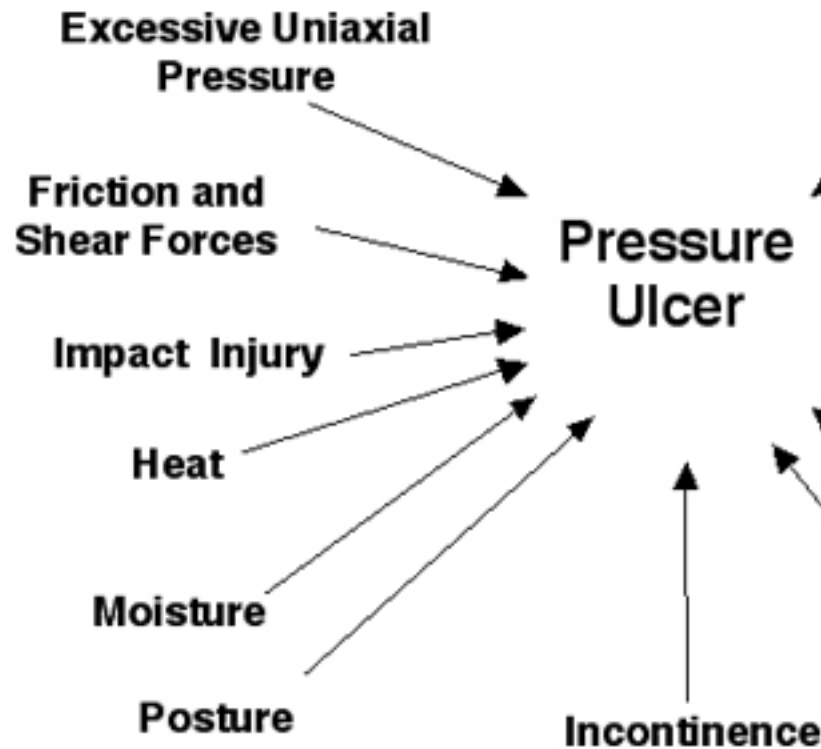
- Sebaceous glands-produce sebum
- Sudoriferous(sweat) glands-produce sweat via eccrine glands over most of the body. Apocrine glands located in axilla and groin region.



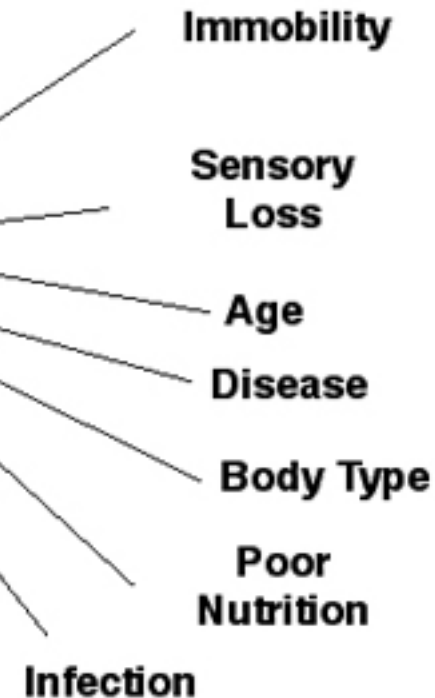
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PRESSURE ULCERS

Extrinsic Factors

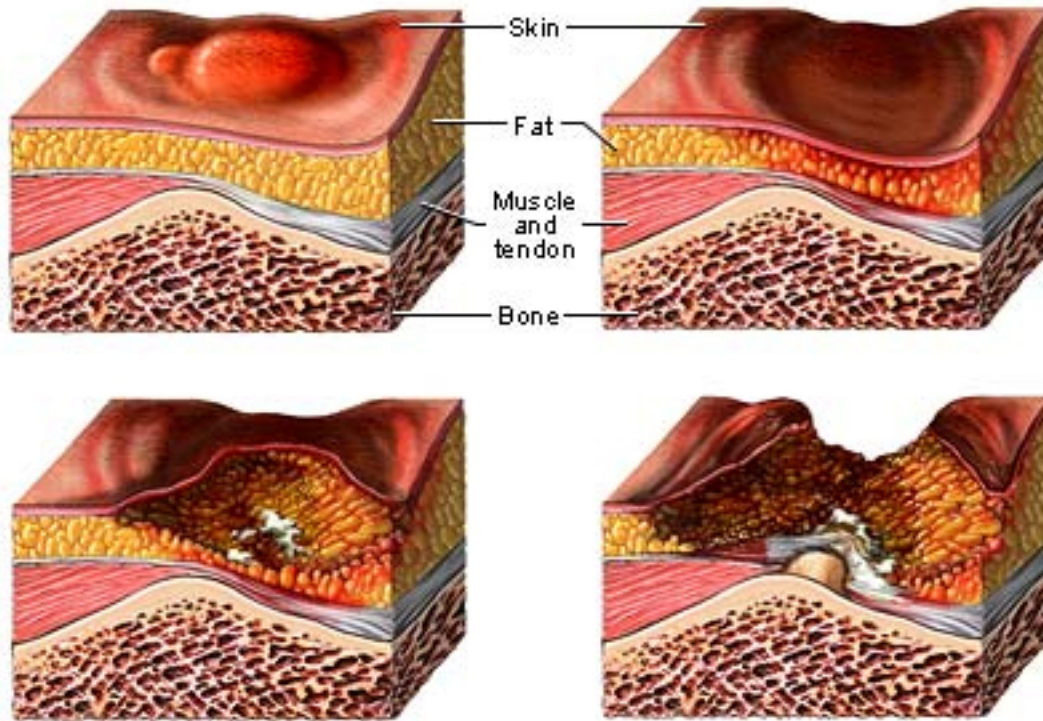


Intrinsic Factors



PRESSURE ULCERS

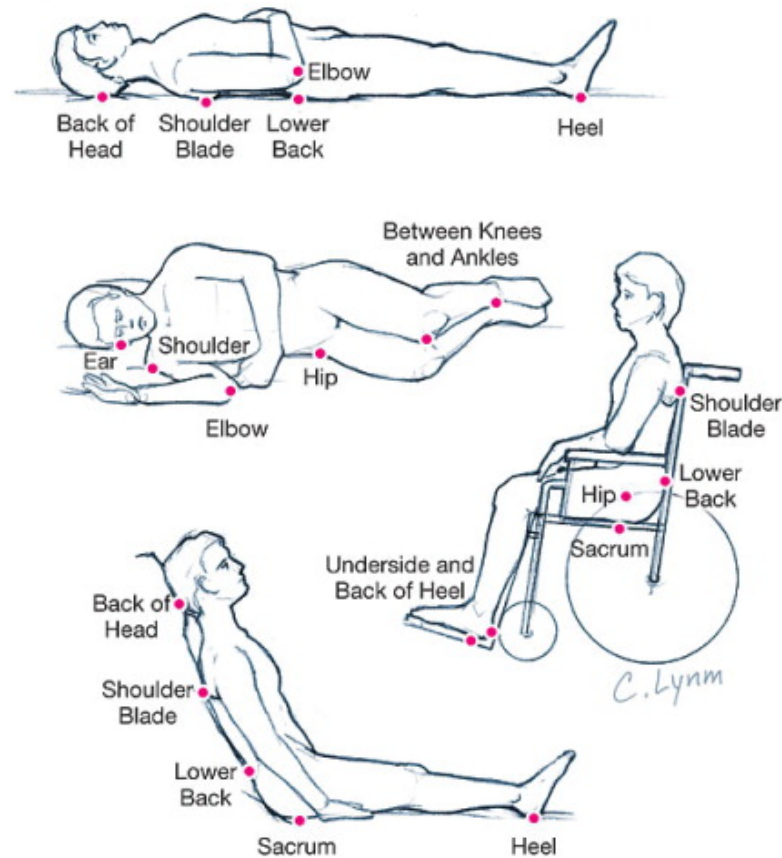
Progression of decubitus ulcer



ADAM.

PRESSURE ULCERS

Common Locations of Pressure Ulcers



STAGE I



STAGE II



STAGE III

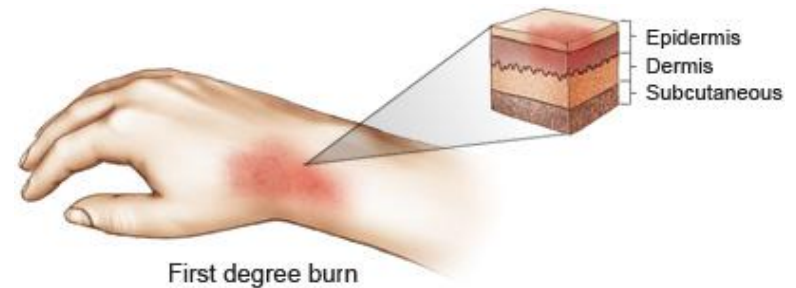


STAGE IV



BURNS

- Classified by depth (severity) and amount of body surface involved



BURN DEPTH

Table 2. Burn Depth Classification.

| Depth | Histology | Appearance | Sensation | Healing |
|-----------------------|---|---|---|---|
| First-degree: | Epidermis only | Erythema; blanches with pressure | Intact; mild to moderate pain | 3-6 days without scarring |
| Second degree: | | | | |
| • Superficial | Epidermis and superficial dermis; skin appendages intact | Erythema, blisters, moist, elastic; blanches with pressure | Intact; severe pain | 1-3 weeks; scarring unusual |
| • Deep | Epidermis and most dermis; most skin appendages destroyed | White appearing with erythematous areas, dry, waxy, less elastic; reduced blanching to pressure | Decreased; may be less painful | >3 weeks; often with scarring and contractures |
| Third-degree: | Epidermis and all of dermis; destruction of all skin appendages | White, charred, tan, thrombosed vessels; dry and leathery; does not blanch | Anesthetic; not painful (although surrounding areas of second-degree burns are painful) | Does not heal; severe scarring and contractures |

MUSCULOSKELETAL SYSTEM



BAKER|NEWMAN|NOYES

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MUSCULOSKELETAL SYSTEM

- Muscular system-movement and protection of underlying structures



MUSCULOSKELETAL SYSTEM

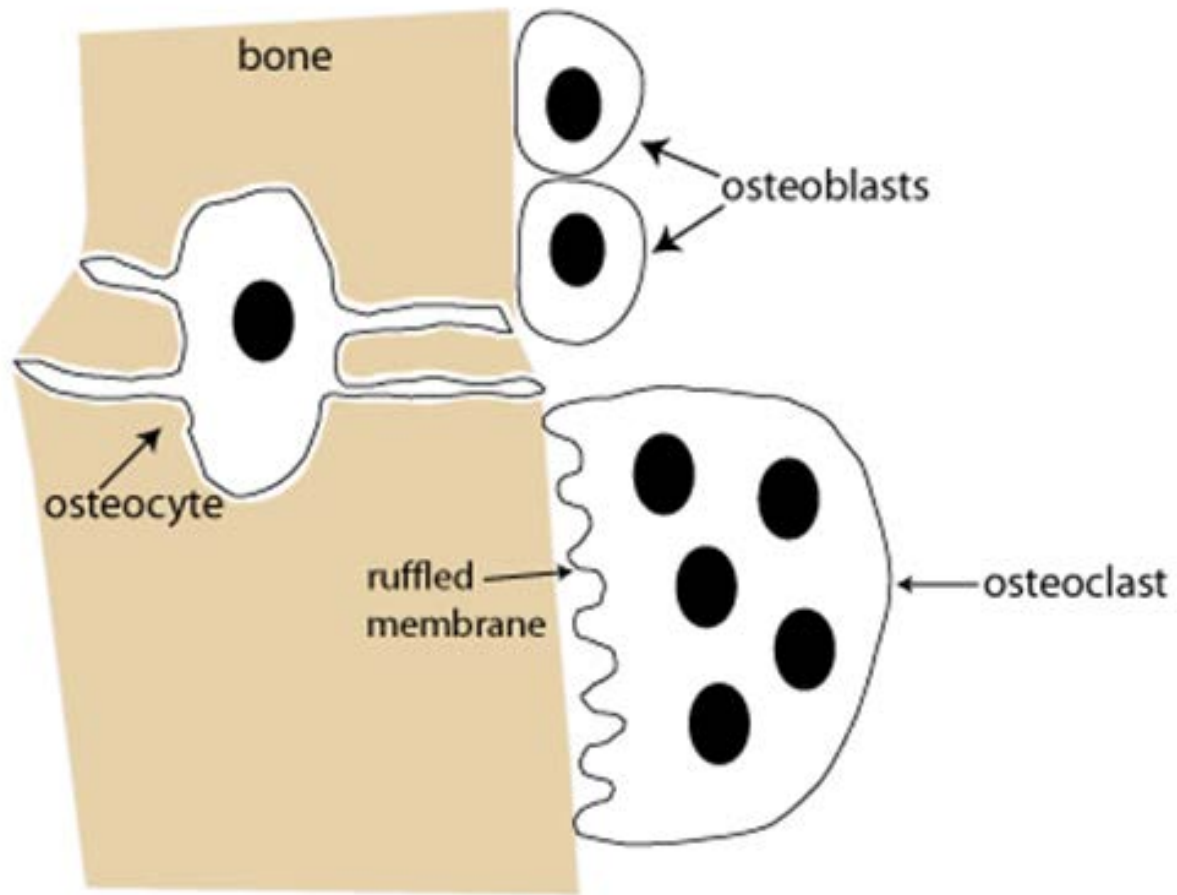
- Skeletal system-structural framework to support body and protect internal organs



SKELETAL SYSTEM

- **Functions**
 - Support
 - Protection
 - Leverage
 - Storage
 - Blood Cell Production

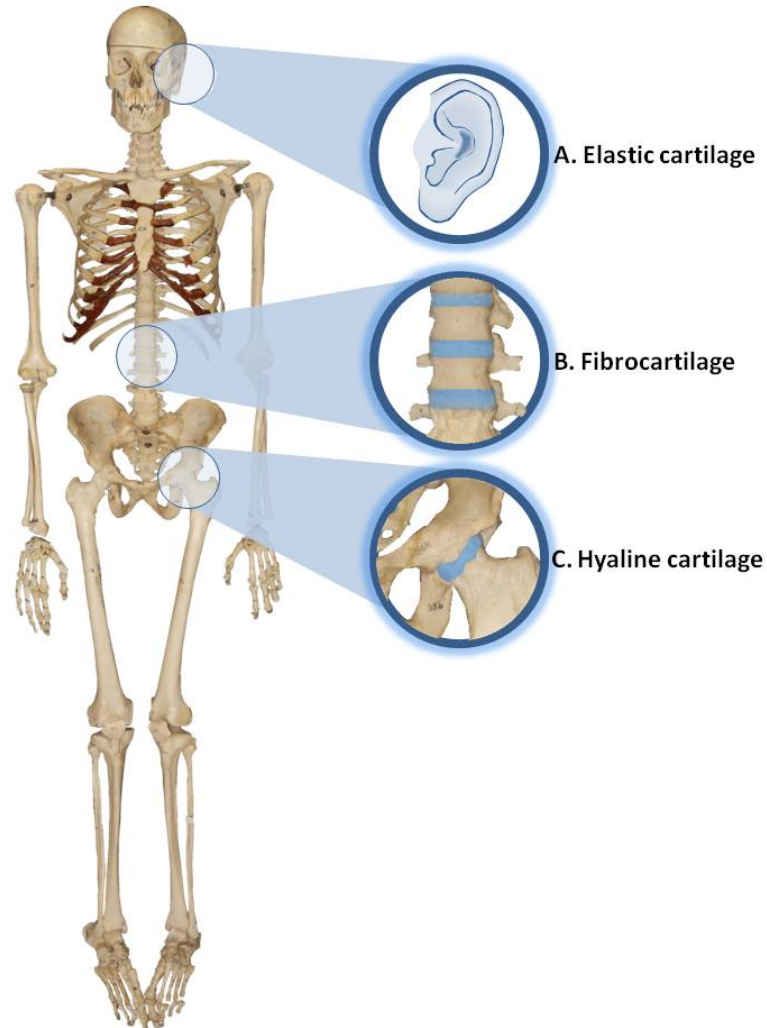
BONE CELLS



- **Osteoblasts**
 - Bone forming
- **Osteocytes**
 - Maintain bone structure & occupy lacunae
 - Mature osteoblasts
- **Osteoclasts**
 - Absorb and remove bone tissue
 - Continually reshaping itself

- **Chondroblasts, chondrocytes, chondroclasts**
 - Same mechanism of action on cartilage tissue

CARTILAGE TYPES



CARTILAGE TYPES

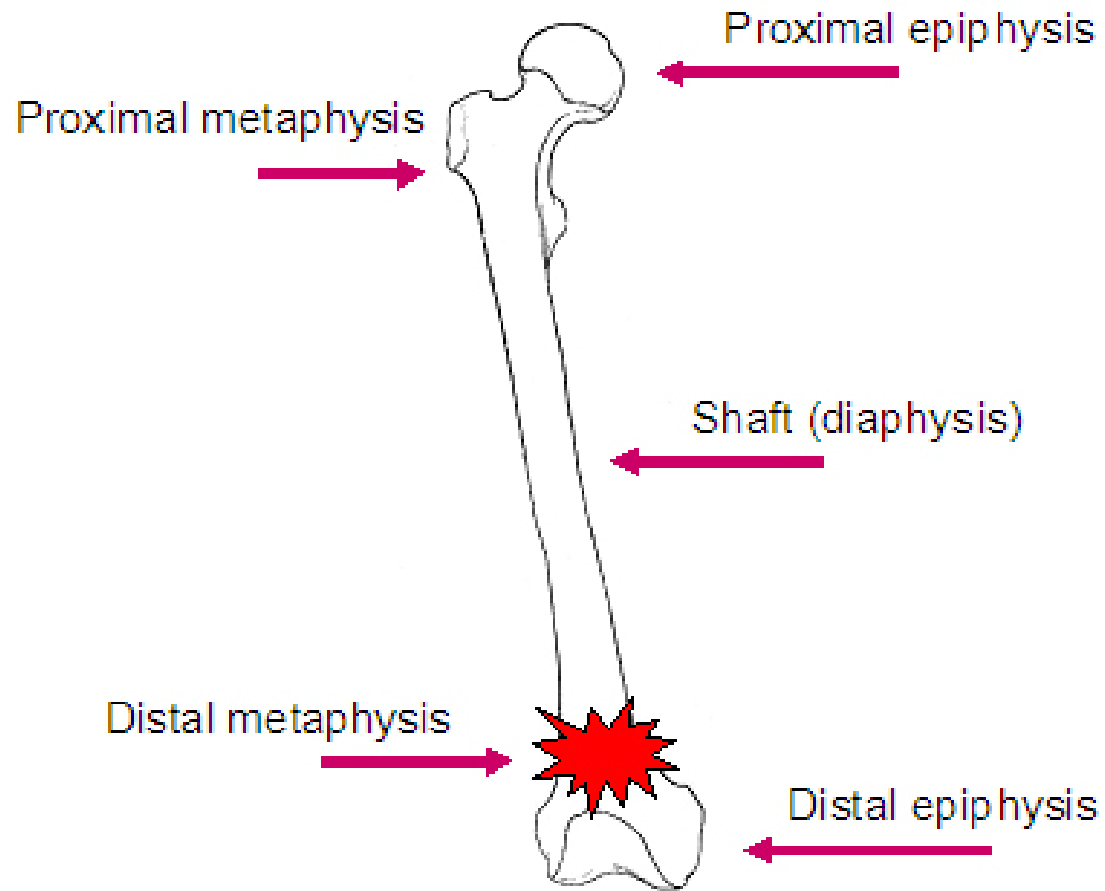
- **Hyaline**
 - Most abundant
 - Flexibility and support
 - In joints-articular cartilage; ends of ribs-costal cartilage
 - Example: nose, larynx, trachea, bronchi

CARTILAGE TYPE

- **Fibrocartilage**
 - Strong and rigid
 - Example: intervertebral discs, symphysis pubis

- **Elastic cartilage**
 - Strength and shape
 - Example: external ear, eustachian tubes

BONE ANATOMY



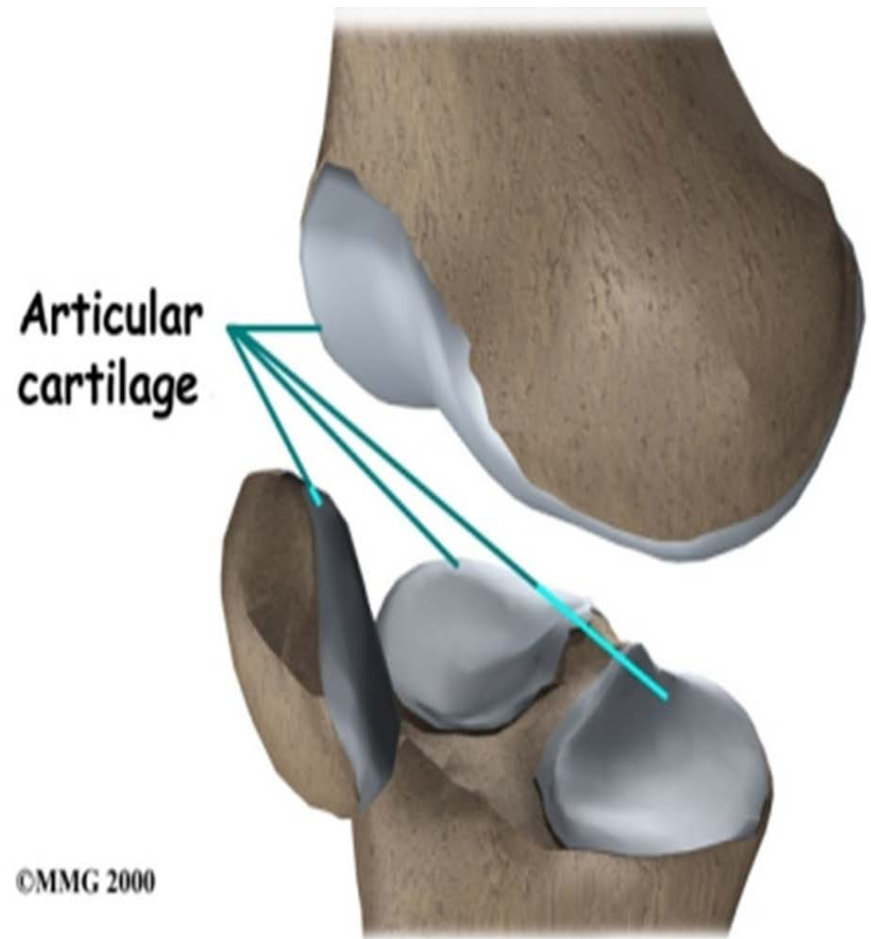
BONE ANATOMY

- **Diaphysis**
 - Shaft or middle section
- **Epiphyses**
 - Spongy (cancellous) bone and contain bone marrow
 - Long bones have 2 epiphyses, one at each end-distal and proximal
- **Metaphysis**
 - Section of bone between epiphysis and diaphysis

BONE ANATOMY

- **Articular Cartilage**

Thin layer of cartilage which covers the epiphyses;
In joint, forms articulation with another bone



GROWTH PLATE

- **Physis**

Synonymous with epiphyseal cartilage, epiphyseal plate, or growth plate

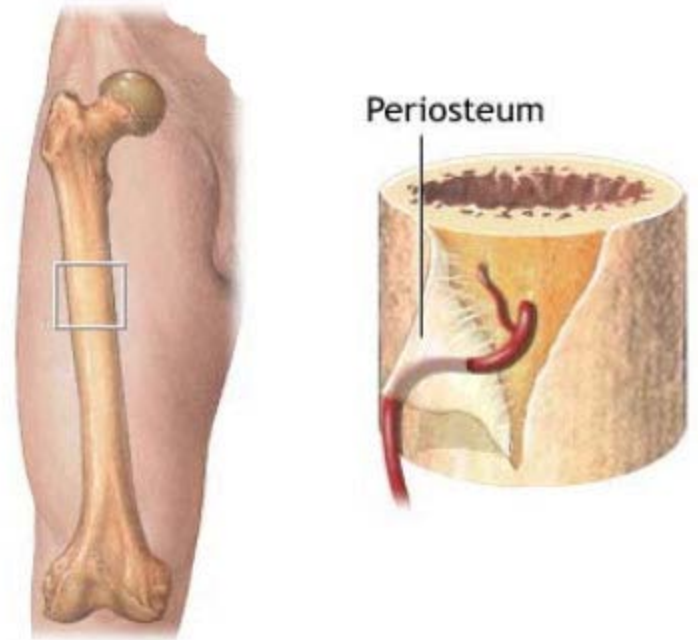


growth plates are outlined in red

BONE ANATOMY

- **Periosteum**

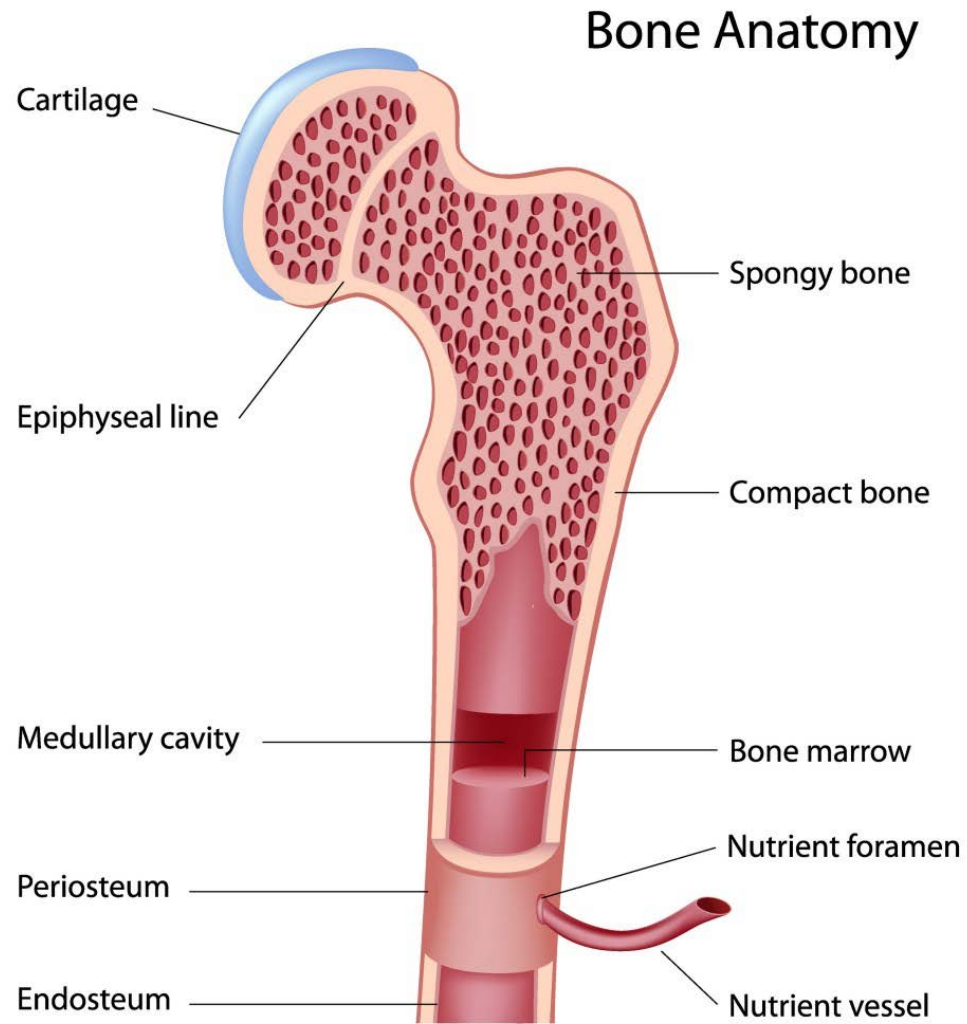
Functions include bone growth and repair, supply nutrients, point of attachment for tendons and ligaments



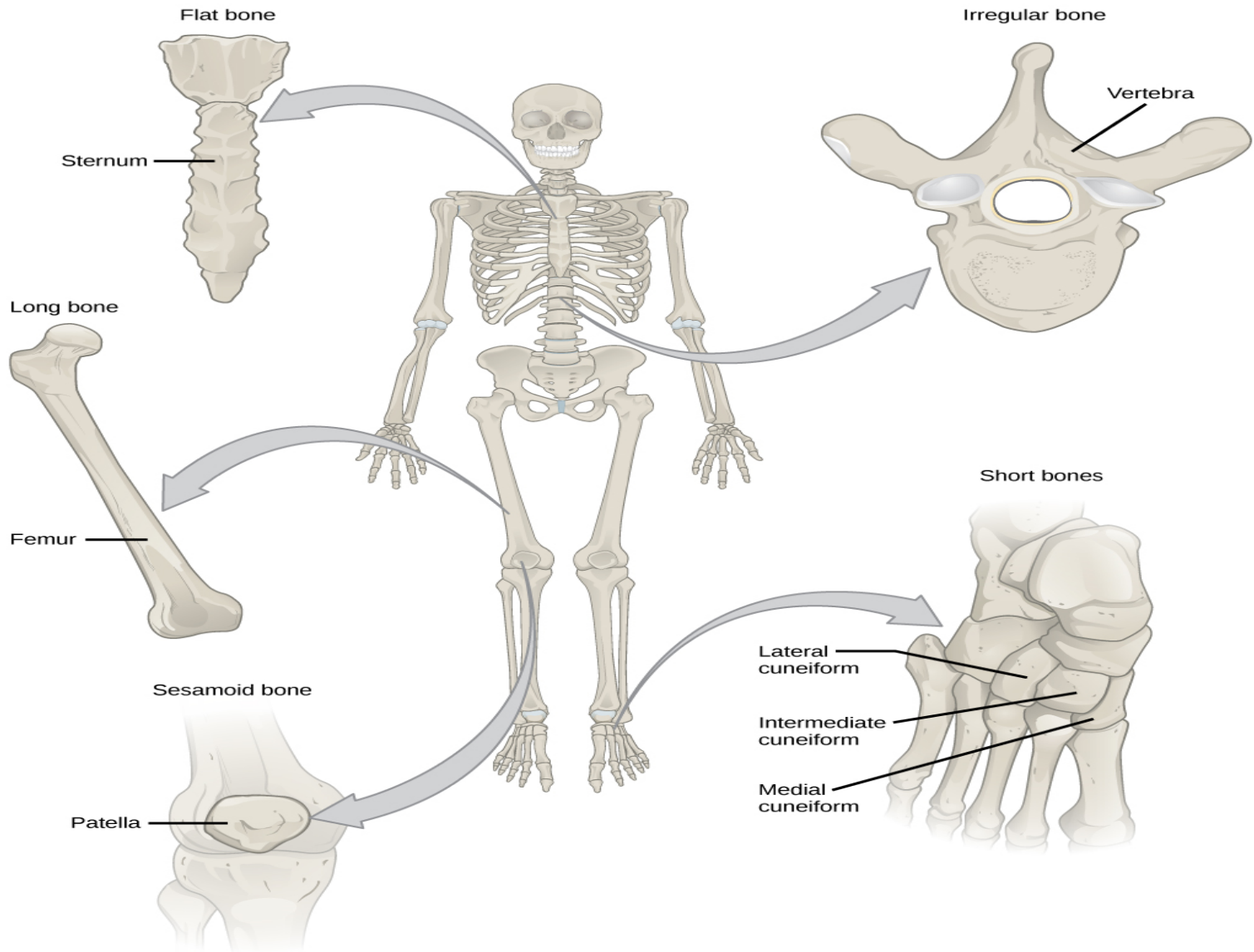
BONE ANATOMY

- **Medullary Cavity**
 - Space within the diaphysis containing bone marrow
- **Endosteum**
 - Membrane lining medullary cavity

BONE ANATOMY



BONE TYPES

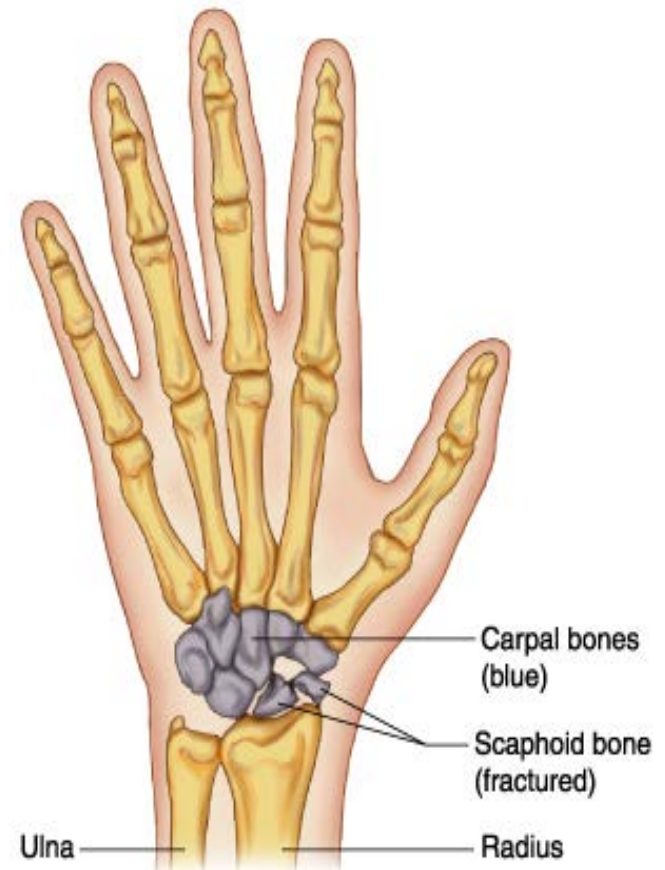


BONE TYPES

- **Long**
 - Greater length than width
 - Growth plates at either end
 - More compact bone than spongy bone
 - Example: Femur, humerus

BONE TYPES

- **Short**
 - Cube-shaped
 - Primarily spongy bone
 - Support and stability with
 - little movement
 - Example: Carpals, tarsals



BONE TYPES

- **Flat**

- Flat, strong plates of bone
- Protect vital organs
- Base for muscle attachment
- Example: scapula, sternum, skull



BONE TYPES

- **Irregular**
 - Non-uniform shape
 - Primarily cancellous (spongy)
 - Example: vertebrae, sacrum, mandible

- **Sesamoid**
 - Short or irregular, embedded in a tendon
 - Example: patella

BONE MARKINGS

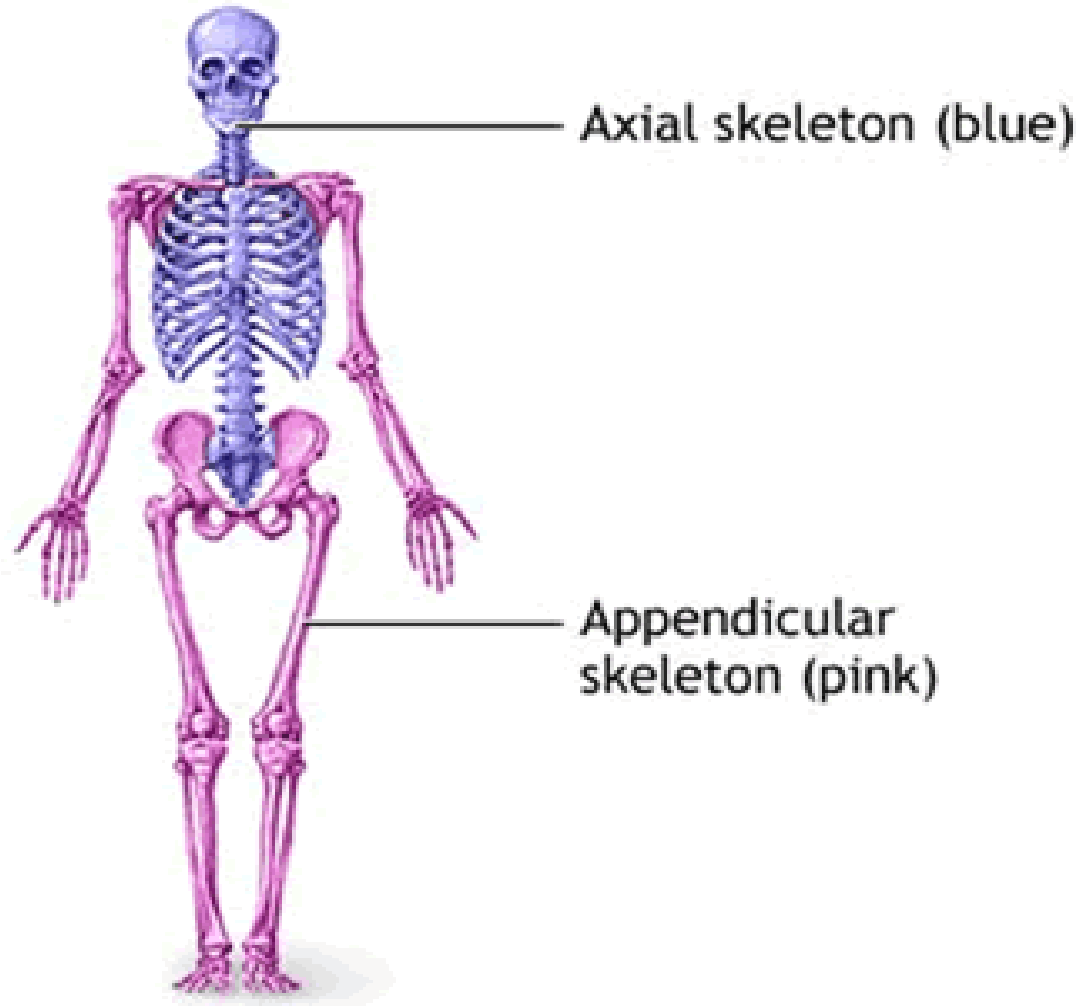
TABLE 6.1 Bone Markings

| Name of Bone Marking | Description | Name of Bone Marking | Description |
|---|---|---|--|
| Projections That Are Sites of Muscle and Ligament Attachment | | Projections That Help to Form Joints | |
| Tuberosity (too"bĕ-ros"ĭ-te) | Large rounded projection; may be roughened | Head | Bony expansion carried on a narrow neck |
| Crest | Narrow ridge of bone; usually prominent | Facet | Smooth, nearly flat articular surface |
| Trochanter (tro-kan"ter) | Very large, blunt, irregularly shaped process (The only examples are on the femur.) | Condyle (kon"dĭl) | Rounded articular projection |
| Line | Narrow ridge of bone; less prominent than a crest | Ramus (ra"mus) | Armlike bar of bone |
| Tubercle (too"ber-kl) | Small rounded projection or process | Depressions and Openings Allowing Blood Vessels and Nerves to Pass | |
| Epicondyle (ep"i-kon"dĭl) | Raised area on or above a condyle | Meatus (me-a"tus) | Canal-like passageway |
| Spine | Sharp, slender, often pointed projection | Sinus | Cavity within a bone, filled with air and lined with mucous membrane |
| Process | Any bony prominence | Fossa (fos"ah) | Shallow, basinlike depression in a bone, often serving as an articular surface |
| | | Groove | Furrow |
| | | Fissure | Narrow, slitlike opening |
| | | Foramen (fo-ra"men) | Round or oval opening through a bone |

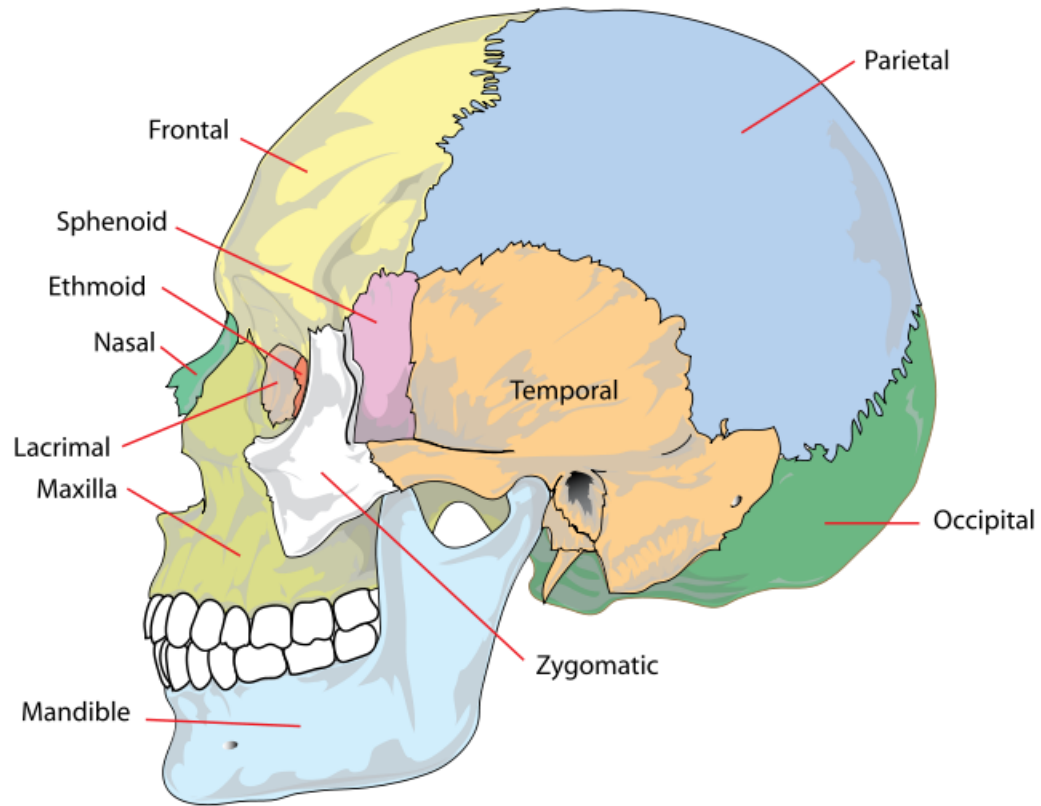
AXIAL & APPENDICULAR SKELETON

- Axial-bones that form axis or center of body (80)
 - Skull, bony thorax, vertebral column
- Appendicular-bones that form appendages/ upper & lower extremities including the pelvis (126)
- 206 total bones

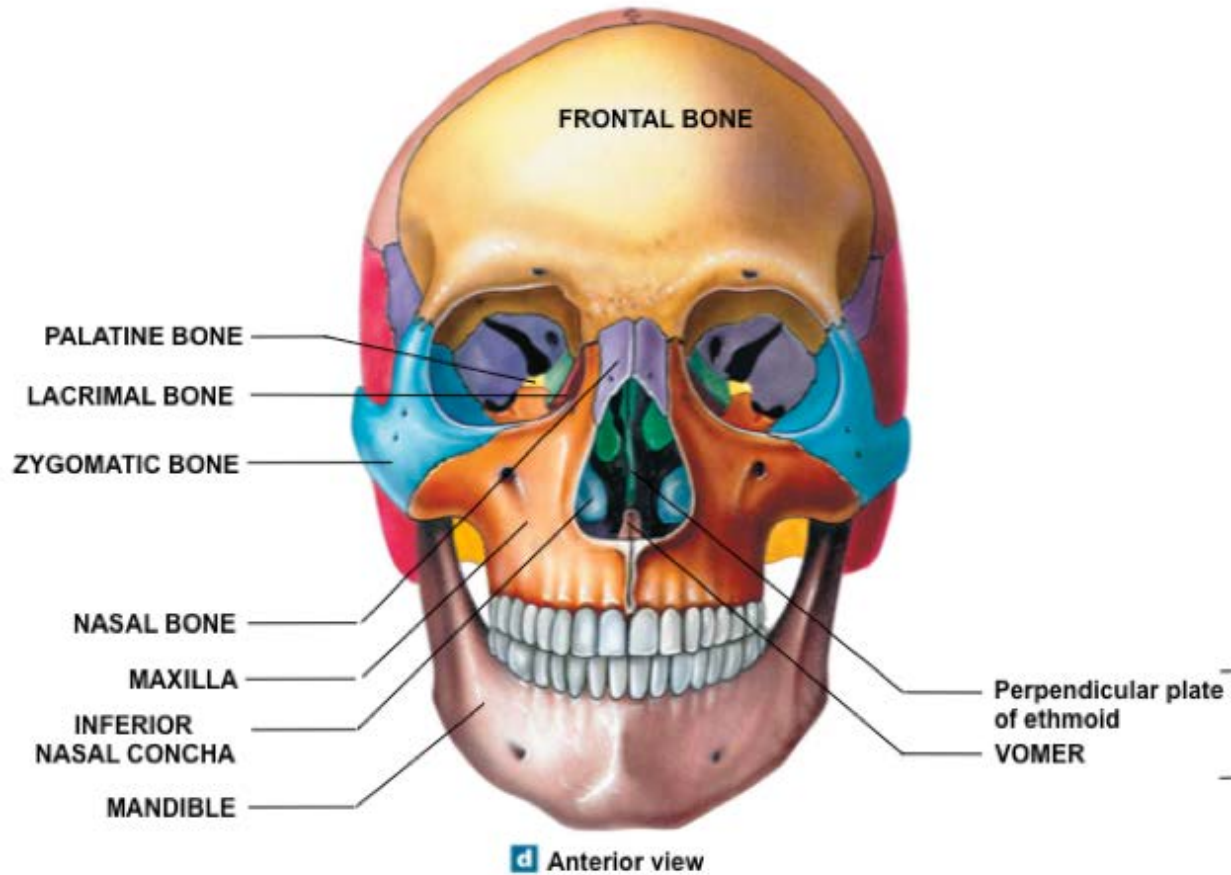
AXIAL & APPENDICULAR SKELETON



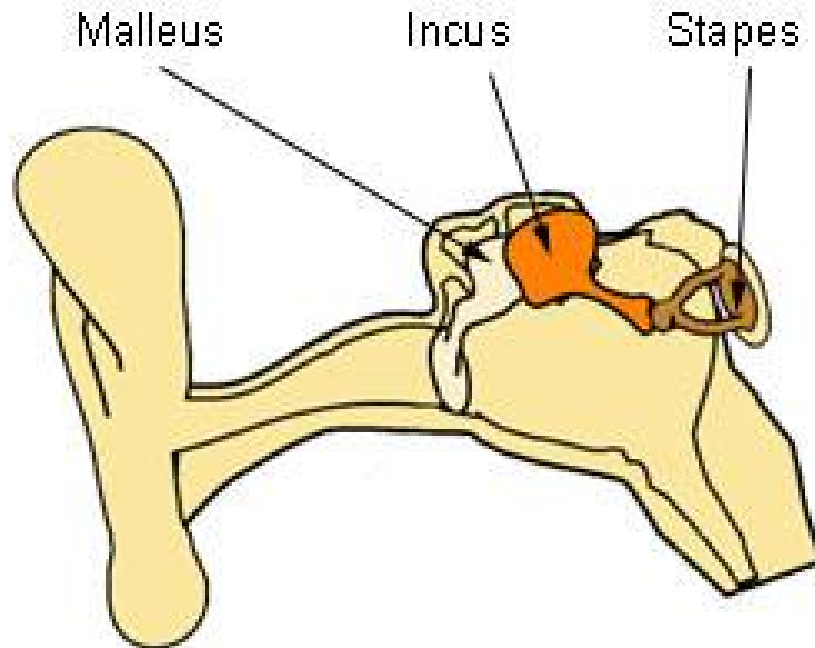
SKULL



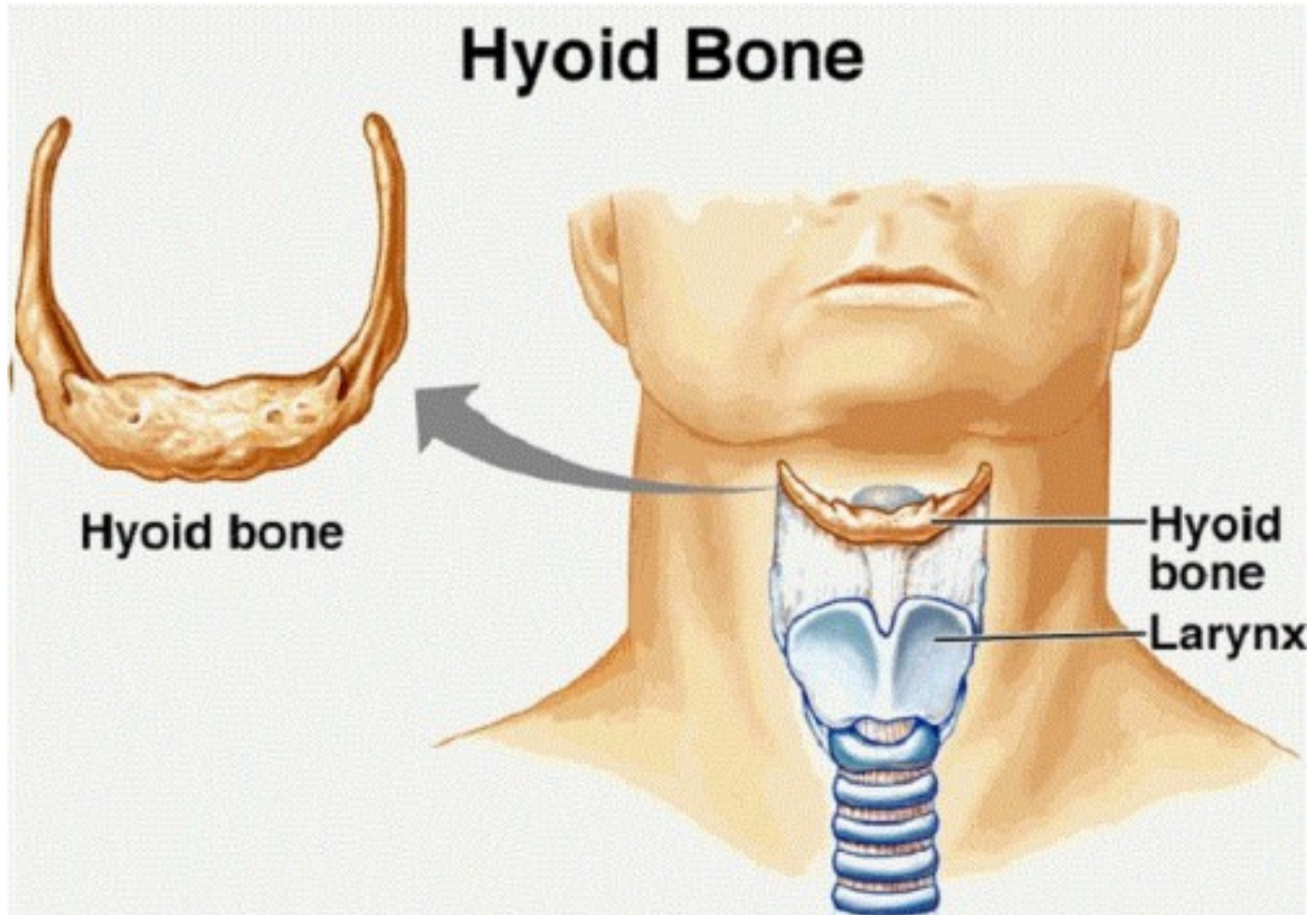
FACIAL BONES



AUDITORY OSSICLES



HYOID



BONY THORAX

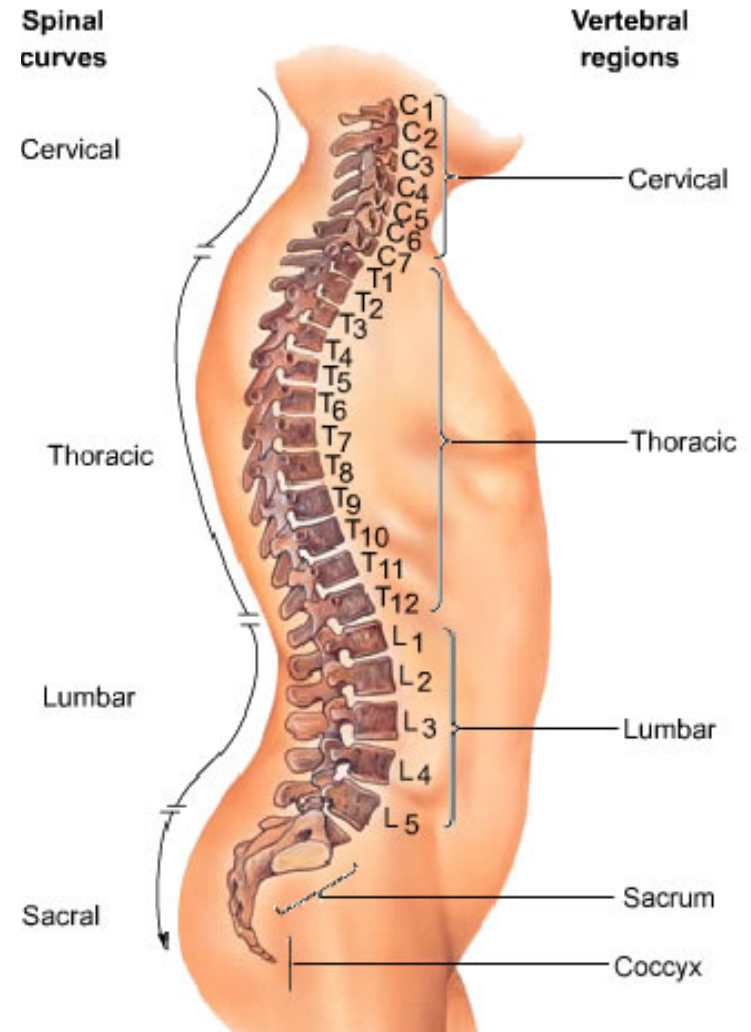
Sternum

Ribs (12 pairs)

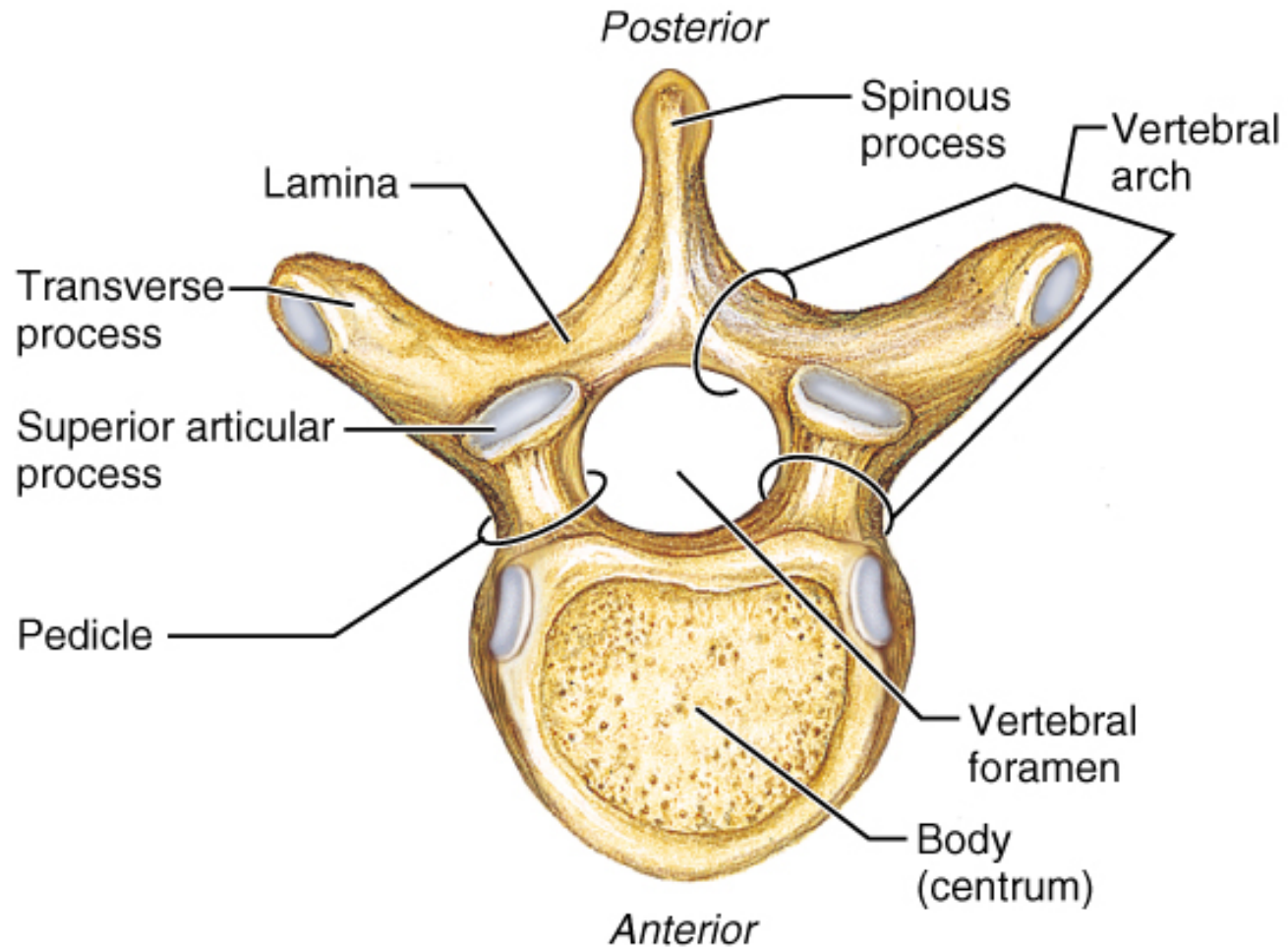


VERTEBRAL COLUMN(SPINE)

7 cervical
12 thoracic
5 lumbar
Sacrum
Coccyx(tail bone)

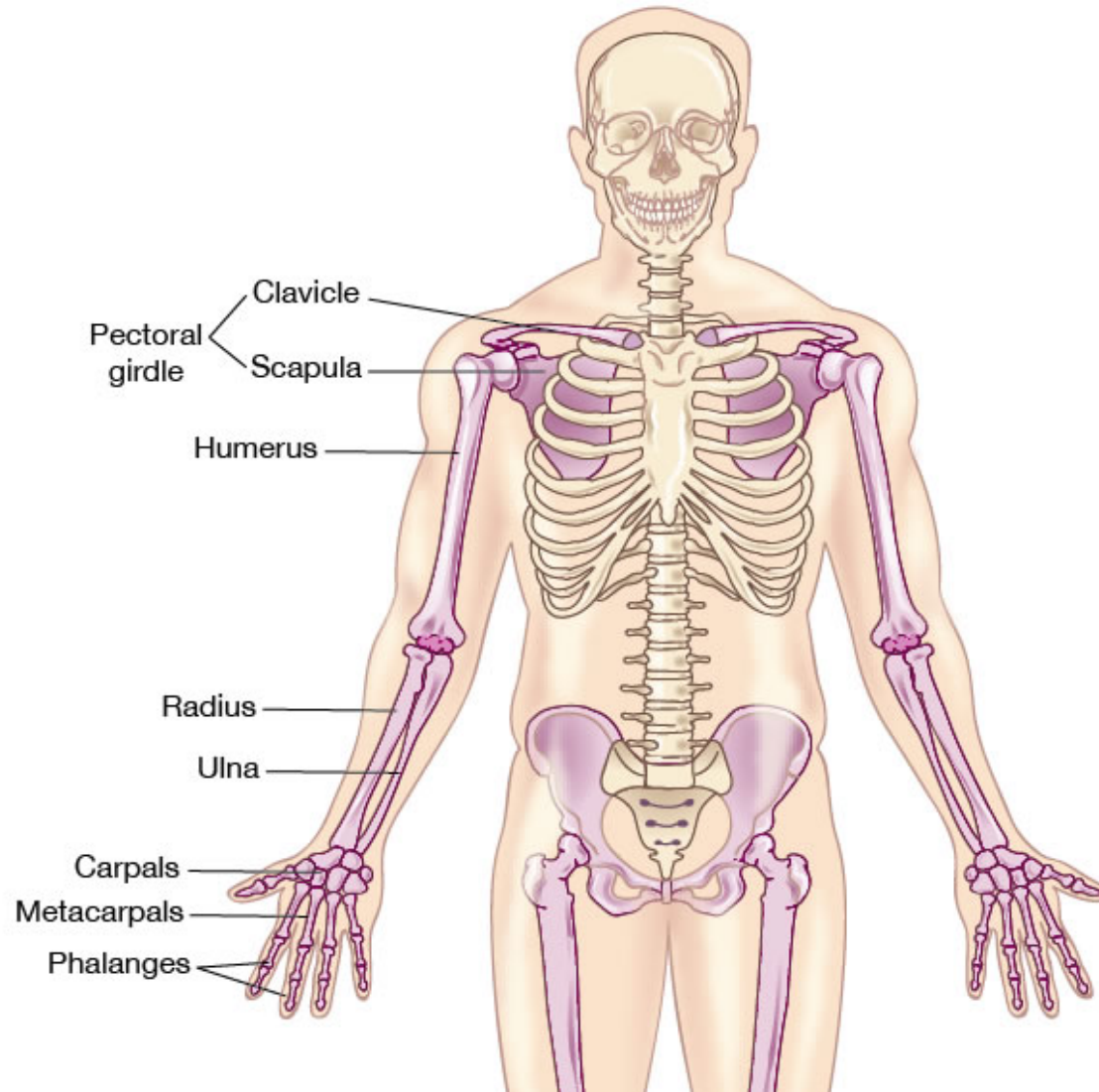


VERTEBRA



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UPPER EXTREMITY

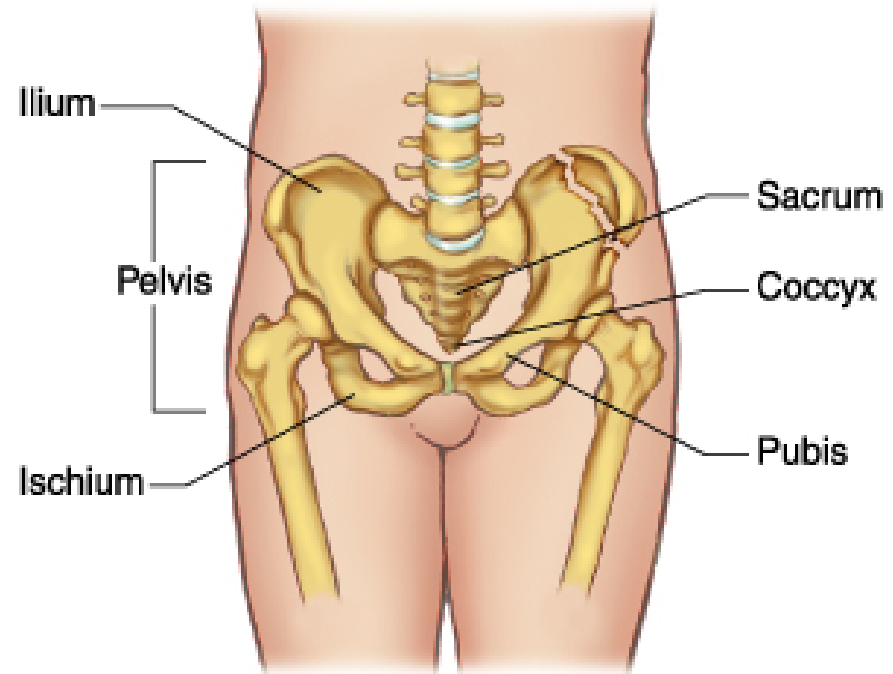


UPPER EXTREMITY

- Shoulder
 - Clavicle, scapula
- Humerus
- Radius
- Ulna
- Carpal bones(8)
- Metacarpals(5), phalanges(14)

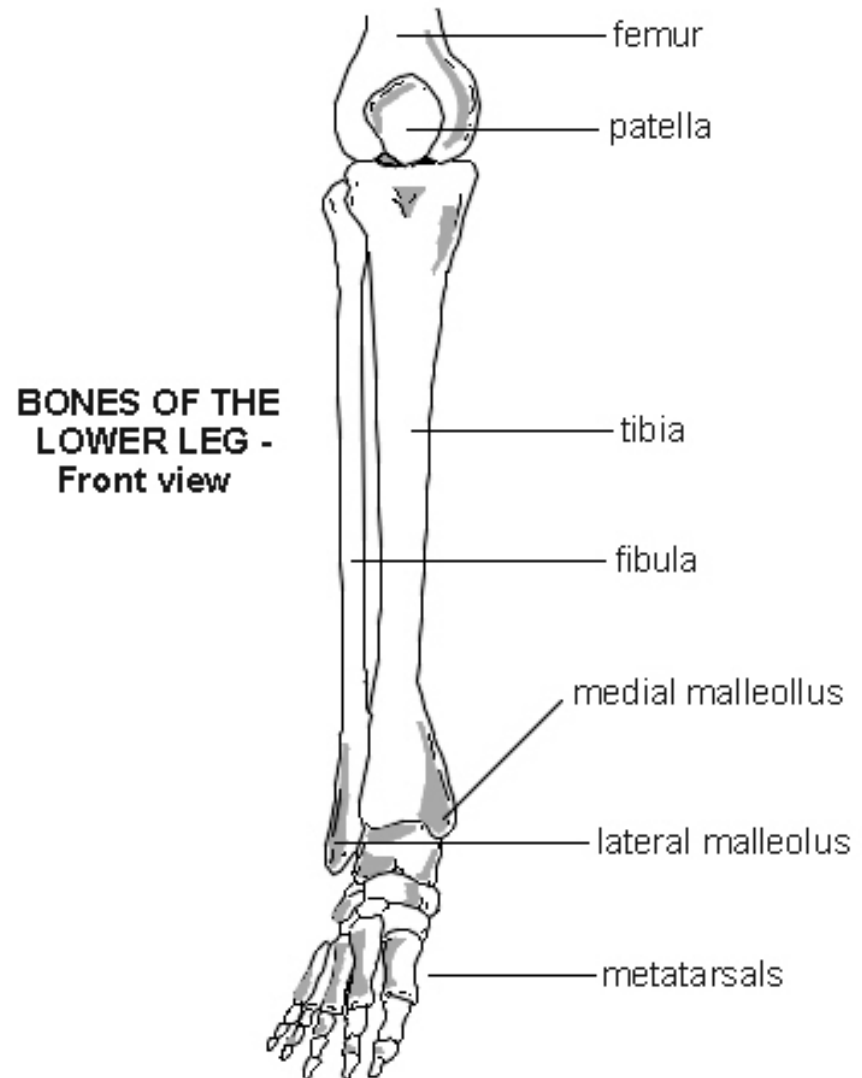
LOWER EXTREMITY

- Pelvic girdle
 - Ilium, pubis, ischium
 - acetabulum



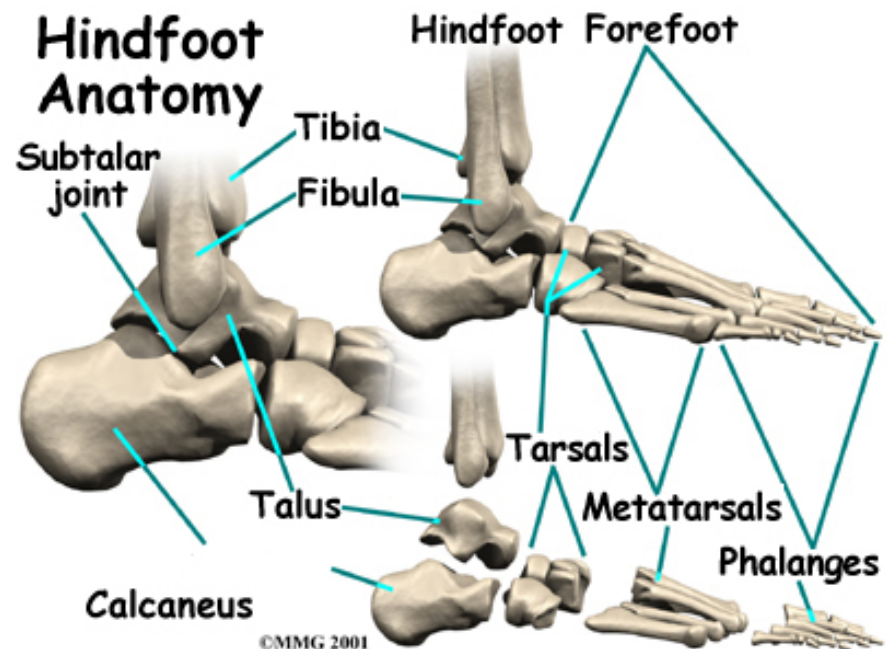
LOWER EXTREMITY

- Femur
- Patella
- Tibia, fibula



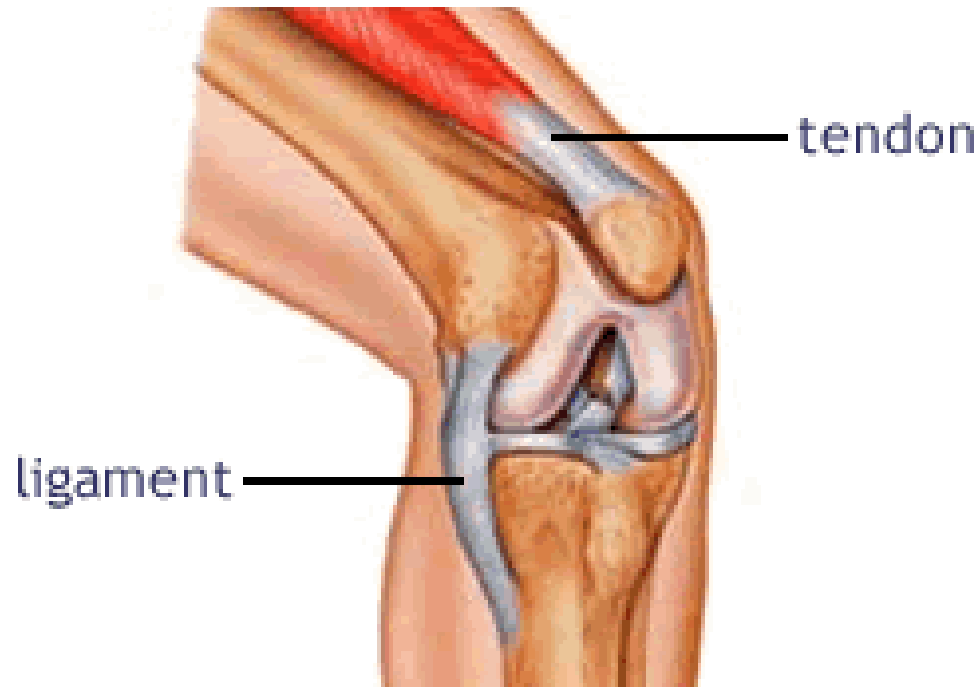
LOWER EXTREMITY

- Ankle
 - Hindfoot-calcaneus, talus, navicular, cuboid
 - Forefoot- Cuneiforms



LIGAMENT & TENDON

- Ligaments-attach bone to bone
- Tendons-connect muscle to bone





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- **Fibrous**

- Little or no movement
- No joint cavity
- Tightly joined by fibrous tissue
- Example: cranial sutures, proximal tibia/fibula

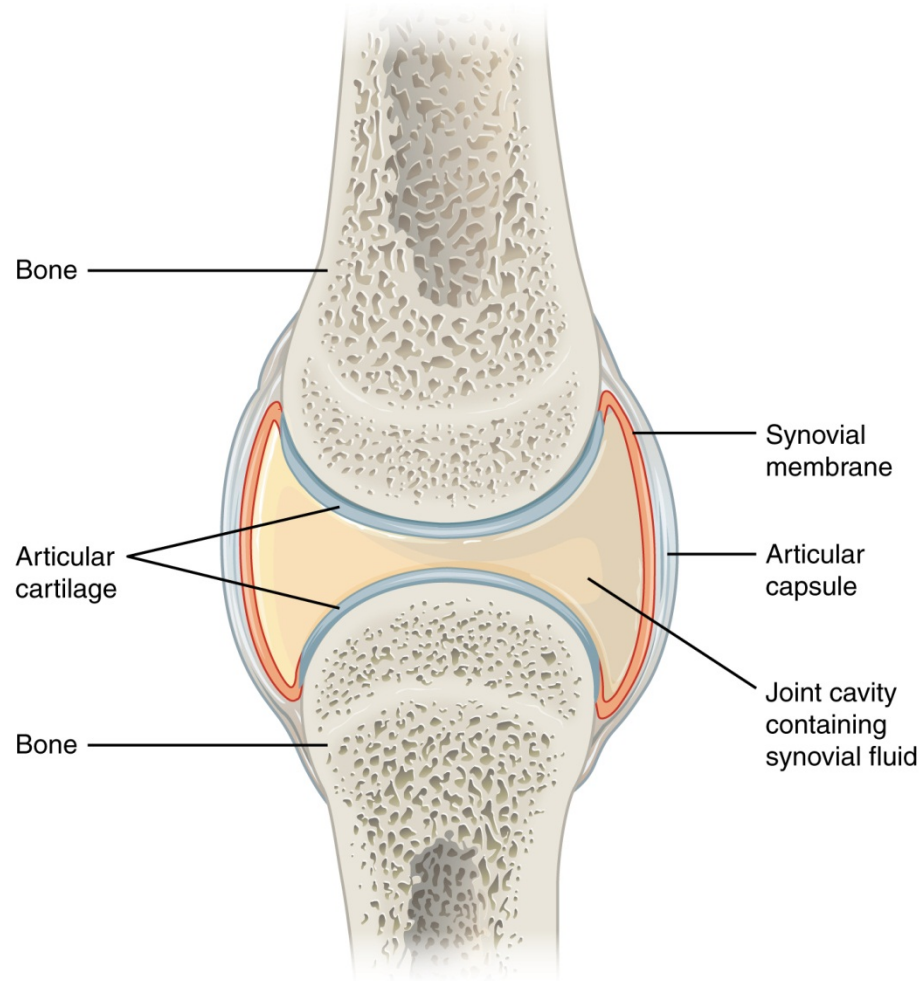
- **Cartilaginous**
 - Little or no movement
 - No joint cavity
 - Tightly joined by cartilaginous tissue
 - Example: intervertebral discs, pubic symphysis

JOINT TYPES

- **Synovial joints**

- Movement determined by ligaments, tendons, muscles, and other bones
- A joint cavity
- Articular cartilage and synovial membrane
- Synovial fluid lubricates joint
- May contain bursae-closed sac containing synovial fluid providing a cushion and reduce friction between bones

SYNOVIAL JOINT

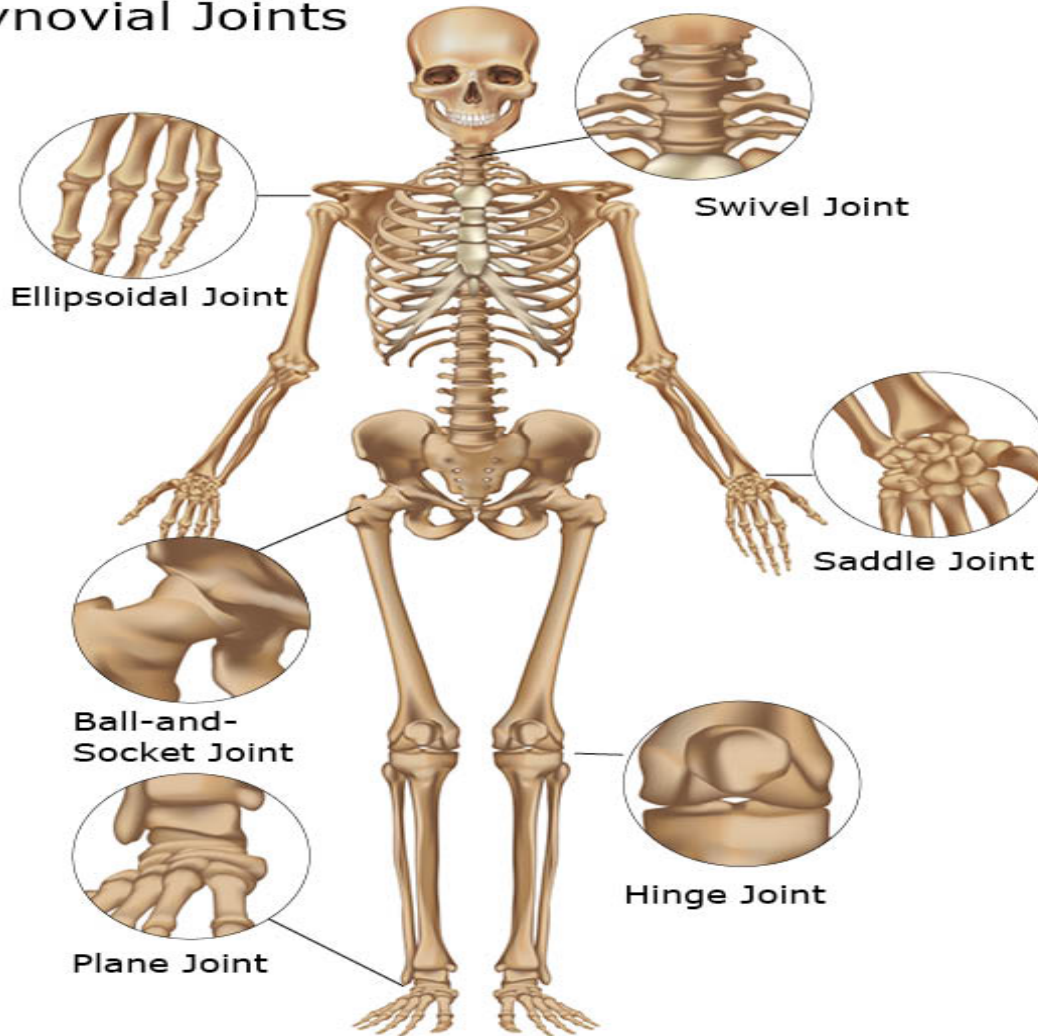


TYPES OF SYNOVIAL JOINTS

- Ball and socket-hip, shoulder
- Condylloid-knuckle and wrist
- Gliding/Plane-wrist, ankle, spine
- Hinge-elbow, knee
- Pivot-neck, elbow
- Saddle-thumb

SYNOVIAL JOINTS

Synovial Joints

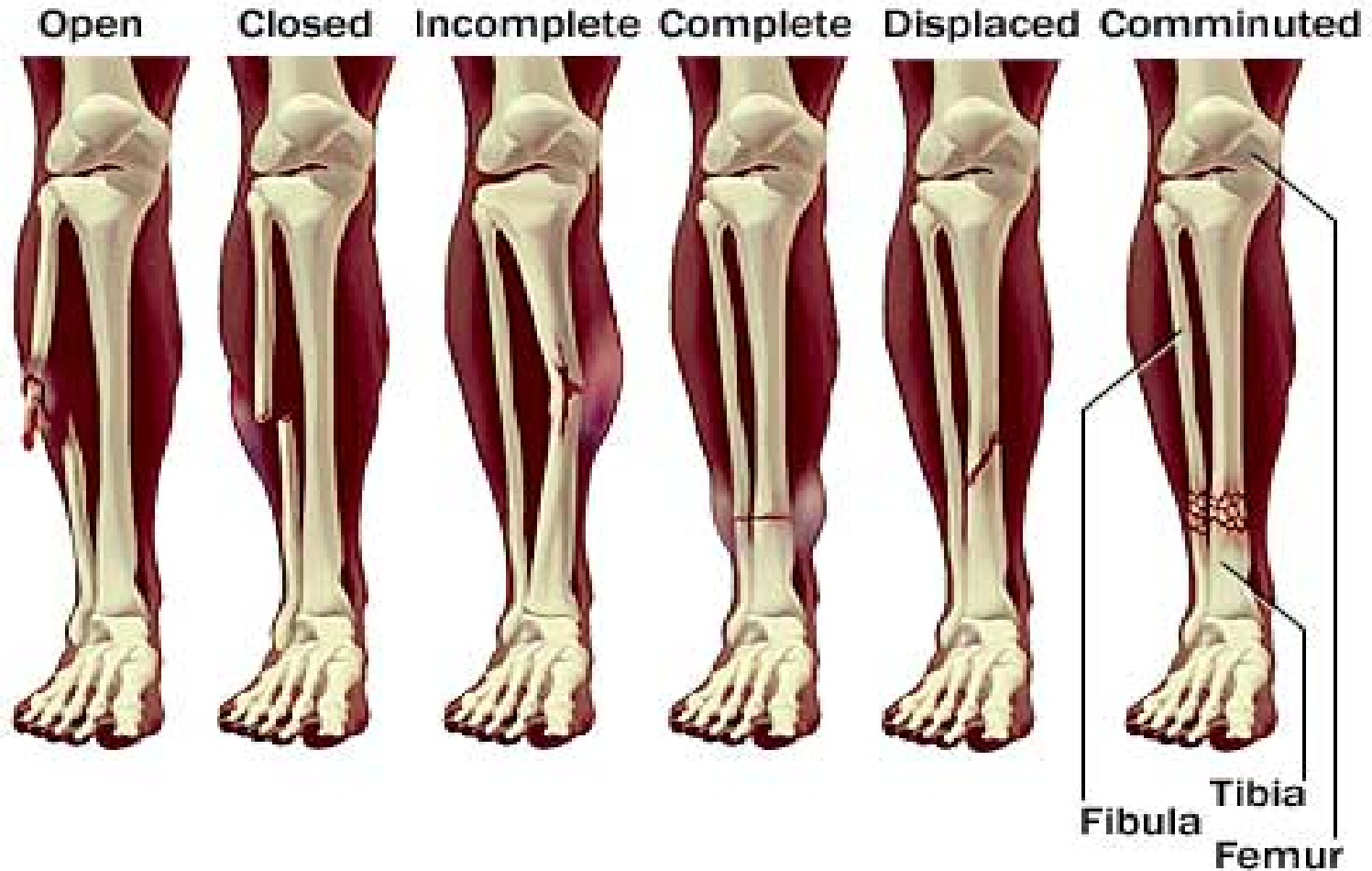


FRACTURES

- Displaced vs. nondisplaced
- Open vs. closed
- Type

- Laterality
- Episode of Care

FRACTURES



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FRACTURE TYPES

- Transverse
- Oblique
- Spiral
- Torus
- Greenstick
- Comminuted
- Compression

FRACTURE TYPES

Fractures



Open (compound)



Closed



Compression



Displaced



Non Displaced



Greenstick



Avulsion



Comminuted



Impacted

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GUSTILO OPEN FRACTURE CLASSIFICATION

- **Defined by 3 characteristics**
 - Mechanism of Injury
 - Extent of soft tissue damage
 - Degree of bone injury or involvement

GUSTILO OPEN FRACTURE CLASSIFICATION

- **Type I**
 - Wound < 1 cm
 - Minimal soft tissue damage
 - Fracture is generally simple transverse, oblique, minimally comminuted
- **Type II**
 - Wound > 1 cm
 - Moderate soft tissue damage
 - No wound bed contamination
 - Same fracture types as Type I

GUSTILO OPEN FRACTURE CLASSIFICATION

- **Type III**

- Wound > 1 cm with extensive soft tissue damage; Typically a high-energy injury

- *Type III A*

- Adequate soft tissue coverage

- *Type III B*

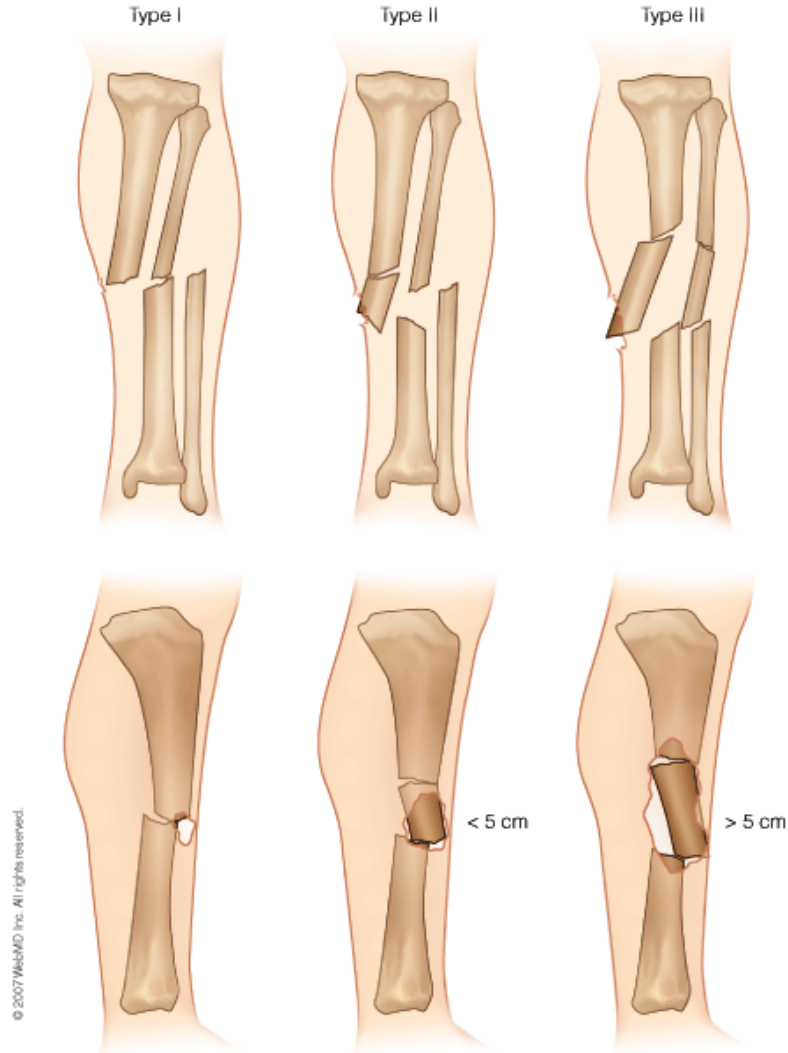
- Extensive soft tissue loss requiring local or distant flap coverage

- Wound bed contamination requiring irrigation/debridement

- *Type III C*

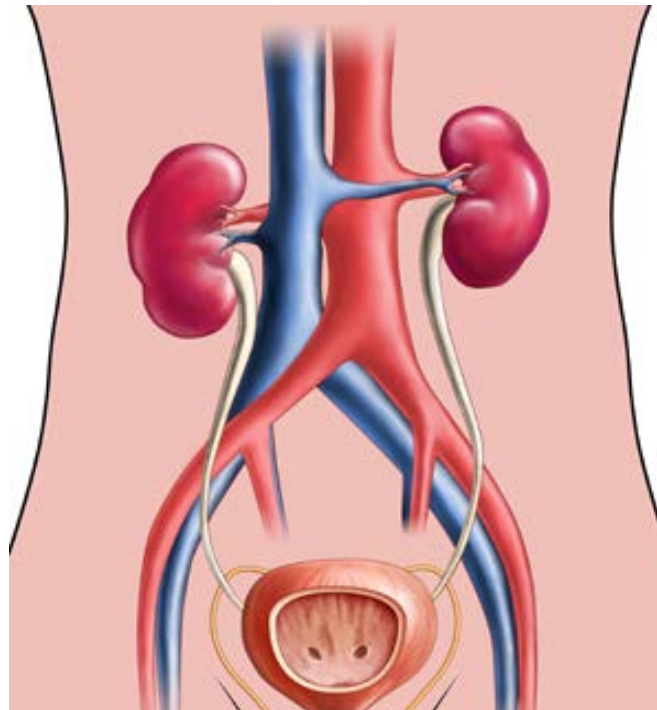
- Associated with major vascular injury

GUSTILO OPEN FRACTURE CLASSIFICATION





GENITOURINARY SYSTEM

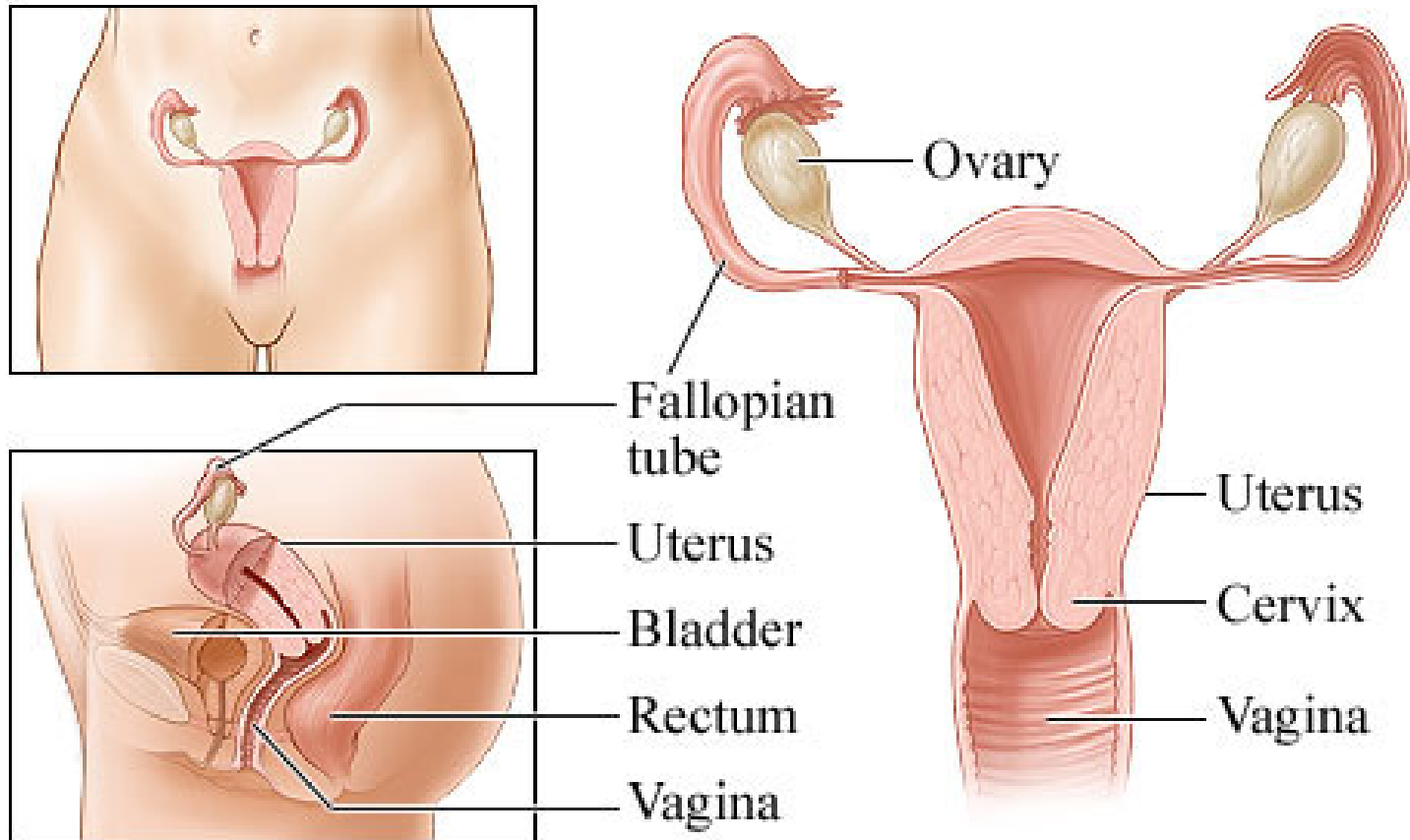


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FEMALE REPRODUCTIVE ORGANS



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- **External Genitalia**
- Labia majora
- Labia minora
- Bartholin's gland; Skene's glands
- Clitoris
- Perineum

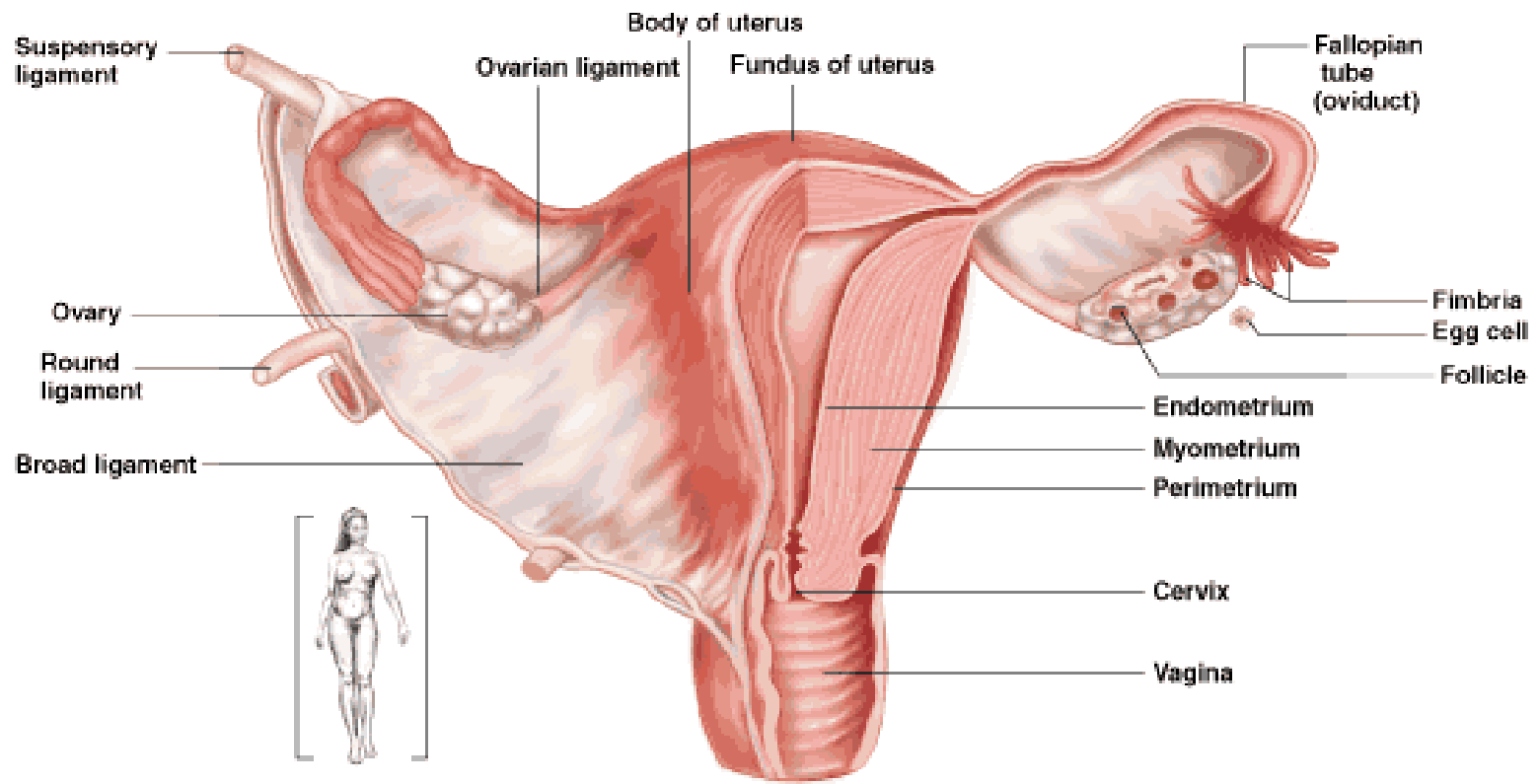


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FEMALE REPRODUCTIVE ORGANS

- **Uterus**
 - Fundus-dome shaped portion
 - Corpus-main body
 - Cervix-opens into vagina
- Round, suspensory, broad and uterosacral ligaments
- Lining of uterus thickens during monthly cycle, in preparation for fertilization of egg
- Lining sheds if fertilization does not occur

FEMALE REPRODUCTIVE ORGANS

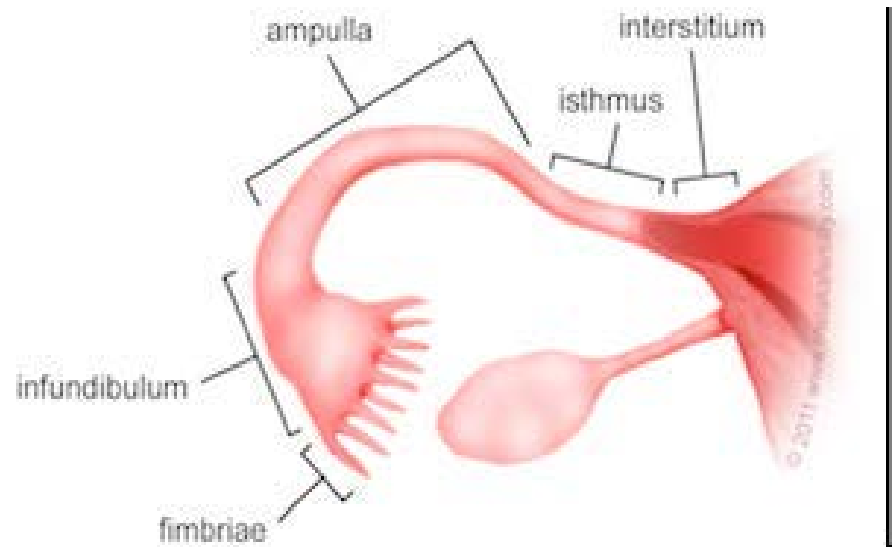


FEMALE REPRODUCTIVE ORGANS

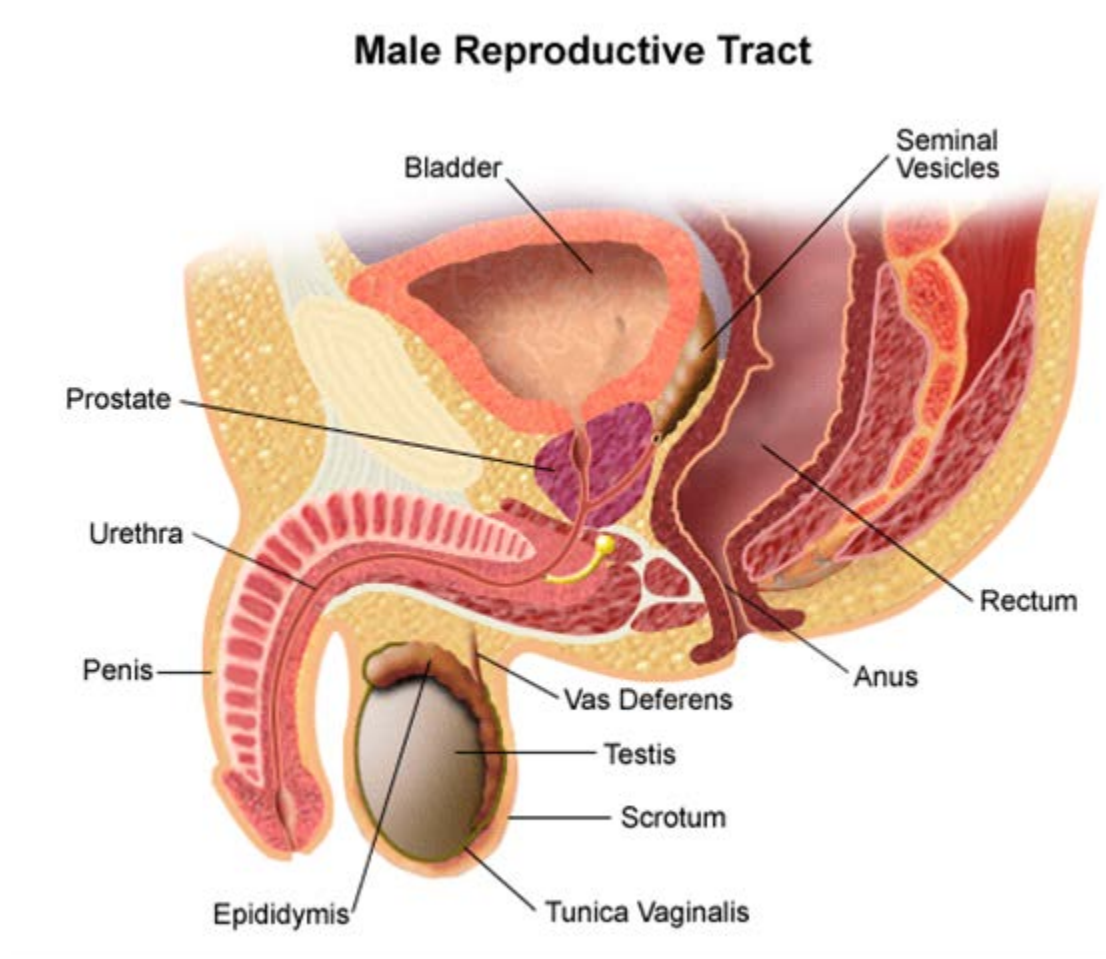
- **Vagina** Elastic, muscular passageway connecting uterus to external genitalia
- **Ovaries** Follicles contain developing egg cells (ova/oocyte)
- Typically release 1 egg every 28 days

FEMALE REPRODUCTIVE ORGANS

- **Fallopian Tubes** Transport egg from ovary to the uterus
- Cilia and muscular wall of tube move egg downward
- **Infundibulum**
- **Ampulla**
- **Isthmus**



MALE REPRODUCTIVE ORGANS



MALE REPRODUCTIVE ORGANS

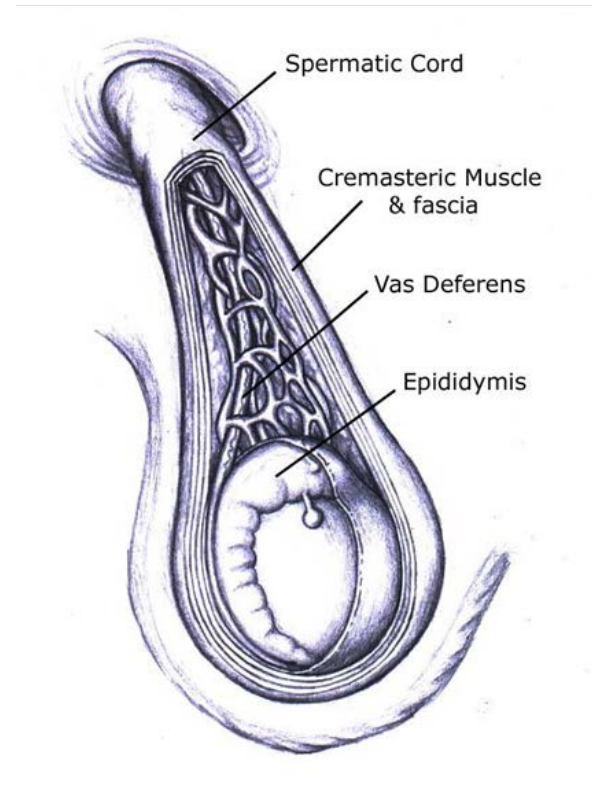
- **Penis**
- **Testes**
 - - Production and storage of sperm (reproductive)
 - - Production of testosterone (endocrine)
 - **Epididymis**
 - Located superior/posterior surface of testes
 - Site of sperm maturation

MALE REPRODUCTIVE ORGANS

- **Vas deferens**
- Tube that transports sperm from epididymis to the urethra
- Additional secretions from seminal vesicles and prostate gland combine with sperm to form semen
- **Ejaculatory duct**
 - Travels through prostate gland to urethra

MALE REPRODUCTIVE ORGANS

- **Spermatic Cord**
 - Passes from inguinal canal to the testis



ACCESSORY GLANDS

- **Seminal Vesicles**
- **Prostate Gland**
 - Exocrine gland that helps in production and storage of seminal fluid
 - Alkaline prostatic fluid neutralizes acidity of vagina, prolonging the life of sperm necessary for fertilization

FEMALE REPRODUCTIVE HORMONES

- **Estrogen-** Secondary sex characteristics
- Growth of reproductive organs
- Assists in calcium uptake to maintain bone density

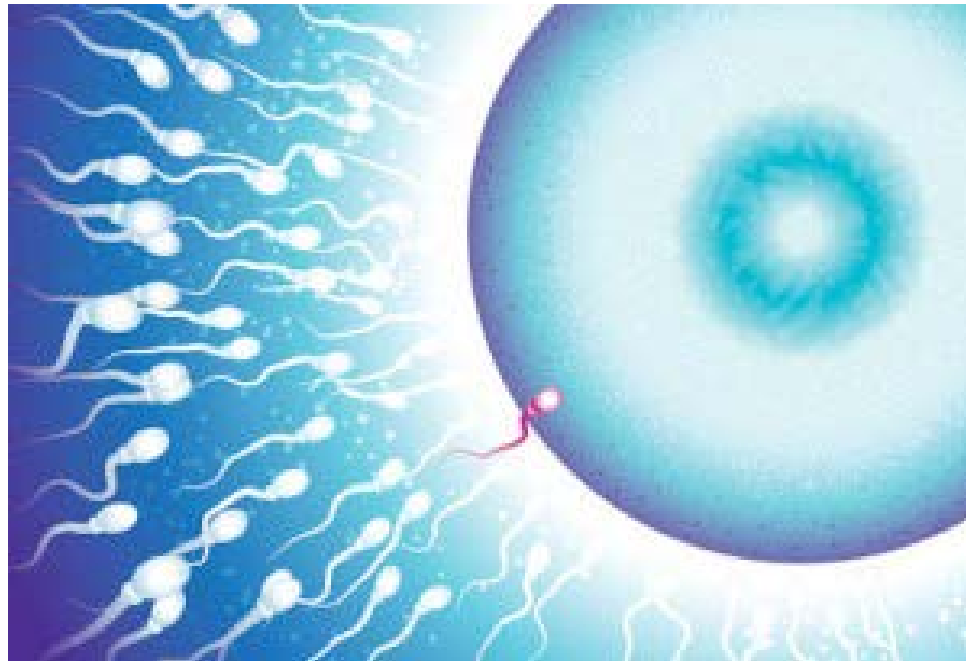
- **Progesterone-** Works with estrogen to establish menstrual cycle
- Maintenance of pregnancy
- Milk production following pregnancy

- Located in breasts
- Increase in size during puberty under influence of estrogen
- Functional during lactation

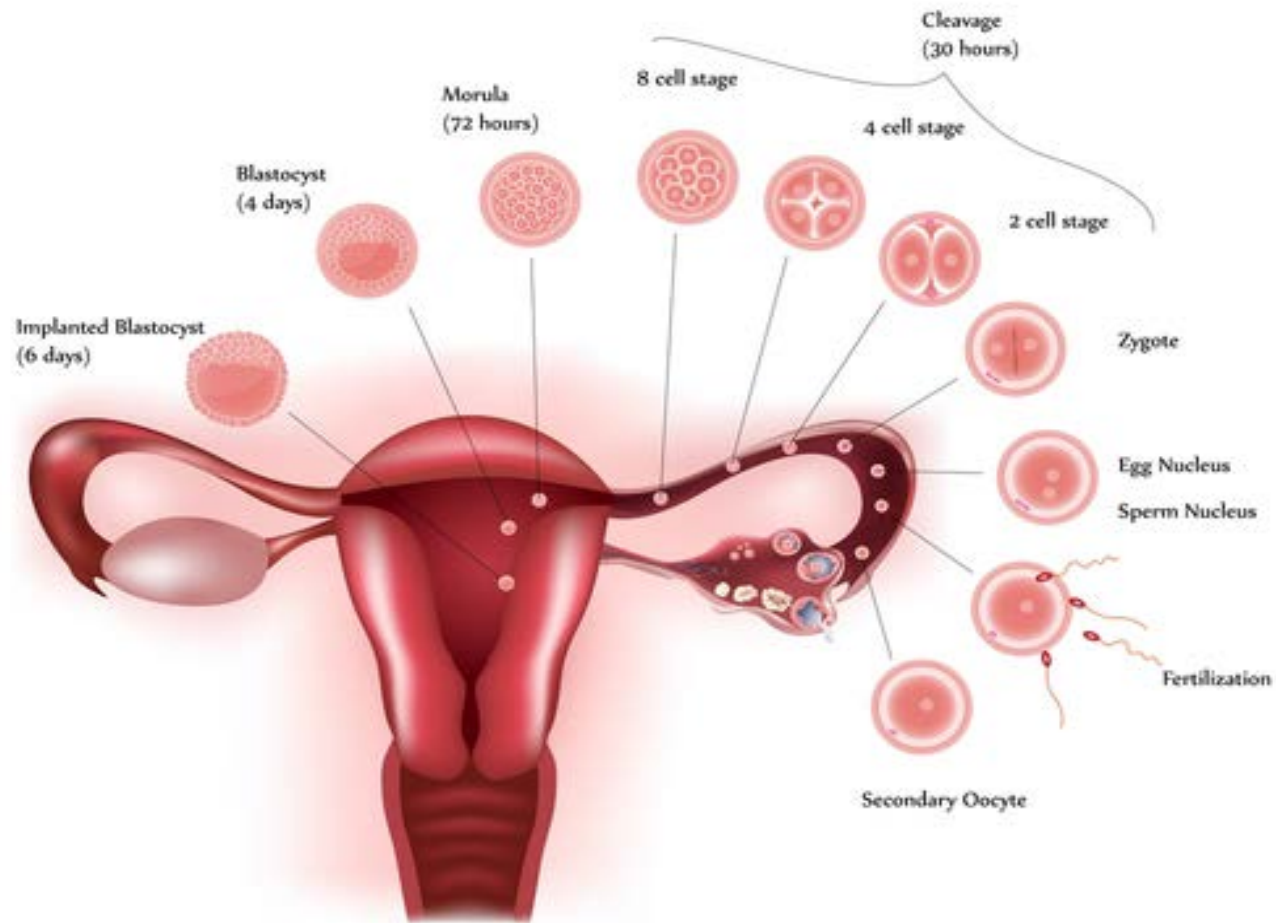


CONCEPTION

- Fertilization generally occurs in the fallopian tube
- Implants in uterus by 7 days after ovulation



IMPLANTATION



DETECTION

- hCG (human chorionic gonadotropin) secreted by newly fertilized egg can be detected in blood and urine 12 days after implantation
- • Missed menstrual period
- • Increased basal body temperature
- • Breast tenderness, fatigue, nausea, spotting, cramping

PREGNANCY DOCUMENTATION

- Gravida=pregnant female
- Nulligravida
- Primigravida
- Multigravida

PREGNANCY DOCUMENTATION

- Parity documented in the following manner: G=# of term pregnancies
- P=# of deliveries
- Numbers following the letter P
- *Number of term pregnancies*
- *Number of premature deliveries*
- *Number of abortions or miscarriages*
- *Number of living children*

PREGNANCY DOCUMENTATION

- Ex. G2P1001 2nd pregnancy with 1 term delivery, no premature deliveries or abortions with 1 living child at home
- • Ex. G3P1104 3rd pregnancy with 1 term delivery, 1 premature delivery with 4 living children at home meaning one of the pregnancies was a triplet pregnancy

PREGNANCY DOCUMENTATION

- 1st trimester-less than 14 weeks
- •2nd trimester-14 weeks-27 weeks 6 days
- •3rd trimester-28 weeks until delivery
- •ICD-10-CM-majority of pregnancy/childbirth codes have final character representing weeks of gestation
- •Ex. Z3A.13

FETAL DEVELOPMENT

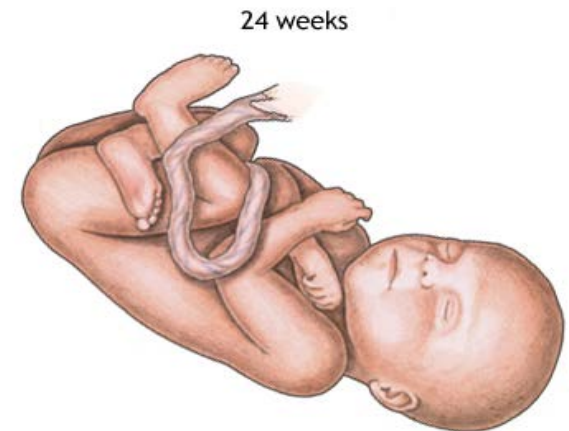
- **First Trimester**
- Up to 13 weeks, 6 days
- Embryo for the first 8 weeks
- Fetus from 2 months until birth
- Rapid growth during
- Placenta develops



Normal fetus
at 12th week
of pregnancy

FETAL DEVELOPMENT

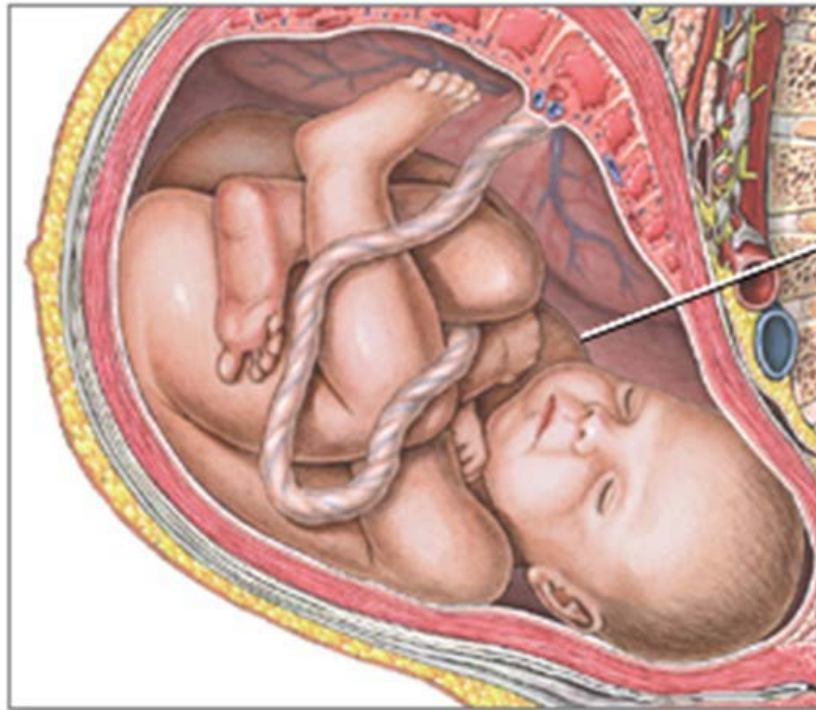
- **Second Trimester**
- 14 weeks – 27 weeks, 6 days
- External signs of pregnancy occur
- Organs mature and skeleton hardens
- Hearing & urinary systems begin to work



FETAL DEVELOPMENT

- **Third Trimester**
- 28 weeks until delivery
- Maternal physical growth along with fetal growth
- Fetal lung maturation
- Head of fetus drops into pelvic cavity

FETAL DEVELOPMENT



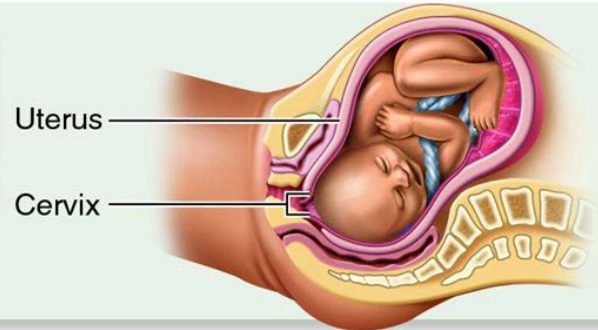
Normal fetus
at 40th week
of pregnancy

LABOR

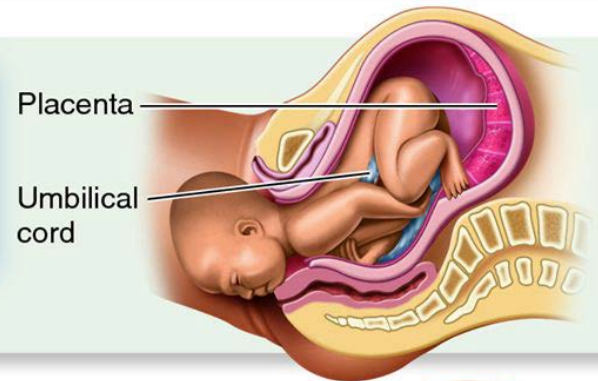
- 3 stages **Dilation**-longest phase; amniotic sac ruptures; cervix fully dilates
- **Expulsion**-Full dilation until delivery and cutting of umbilical cord
- **Placental**-placenta detaches from uterine wall

LABOR

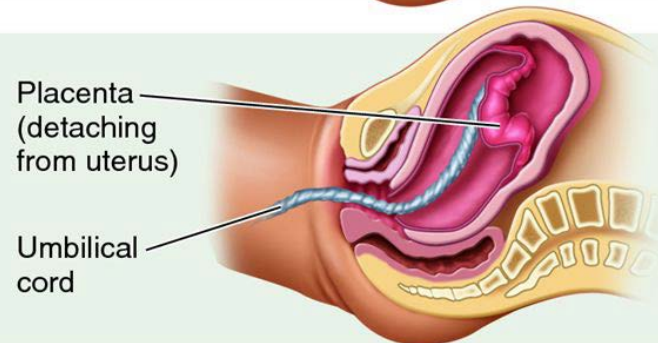
Stage 1:
The cervix relaxes,
causing it to dilate
and thin out.



Stage 2:
Uterine contractions
increase in strength
and the infant is
delivered.



Stage 3:
The placenta
is expelled.



INCONTINENCE HOT LINE



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QUESTIONS??



Thank you!

Dianne Rodrigue, PA, MHP, CPC

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