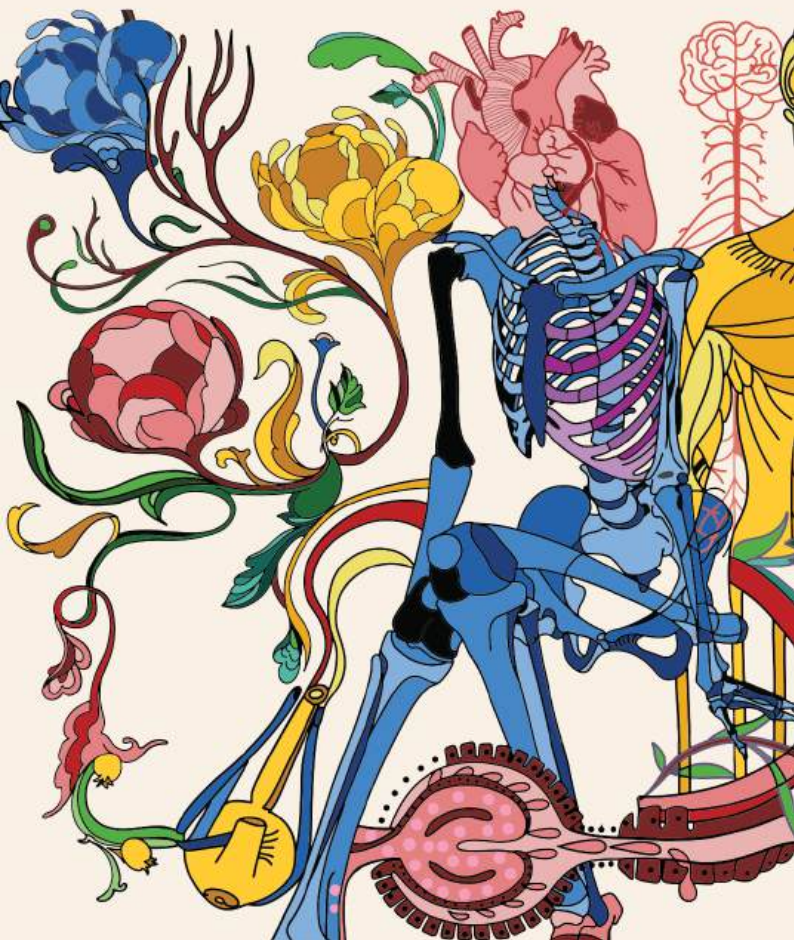


THE HUMAN BODY FROM BLUEPRINT TO BEING

DOX
TUTORIALS



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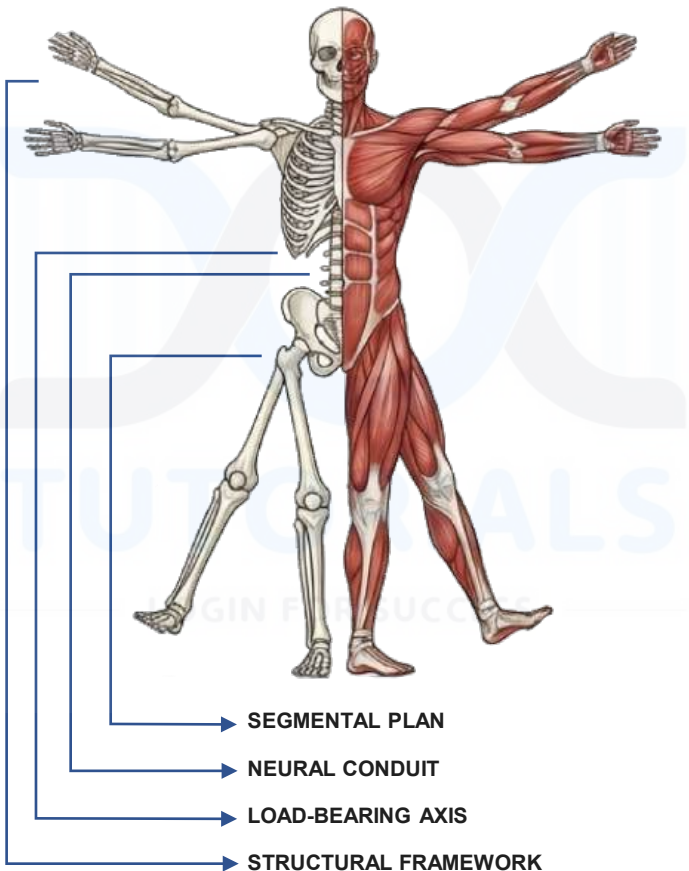
Dr Jayaprakash K
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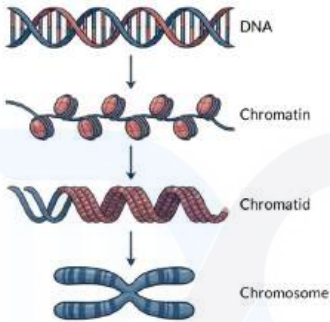
The Human Body: From Blueprint to Being:

A visual journey through the architecture of human anatomy.



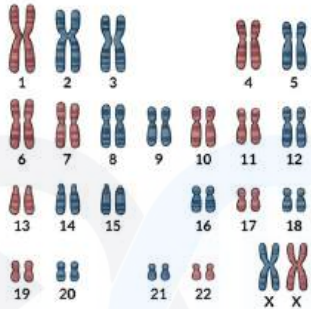
The Genetic Blueprint is Organized into 46 Chromosomes:

DNA Coiling Process

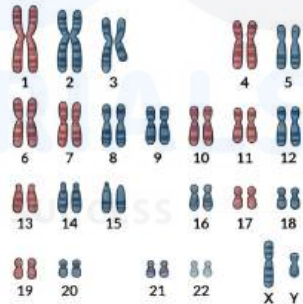


The carriers of DNA are organized into 23 pairs in somatic (diploid) cells. This includes 22 pairs of autosomes and 1 pair of sex chromosomes (XX or XY). Karyotyping is the technique used to visualize and analyze this chromosomal arrangement.

46, XX



46, XY



CLINICAL INSIGHT: Numerical Aberrations

Errors in cell division can lead to aneuploidy (abnormal chromosome numbers). For example, Trisomy 21 (three copies of chromosome 21) results in Down syndrome. 47, XXV results in Klinefelter Syndrome.



The First Three Weeks Transform a Single Cell into a Three-Layered Embryo:



Zygote

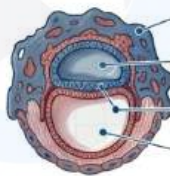


Blastocyst

Week 1: Implantation. A zygote undergoes cleavage to form a blastocyst, which implants in the uterine wall.



Trilaminar Disc



Bilaminar Disc

Week 2: 'The Week of Twos'. The embryoblast forms two layers (epiblast, hypoblast) and two cavities (amniotic, yolk sac). The syncytiotrophoblast produces HCG.

Week 3: Gastrulation. The bilaminar disc becomes a trilaminar disc via the primitive streak, establishing the primary germ layers.

The Fates of the Germ Layers



Ectoderm (Nervous system, Epidermis).



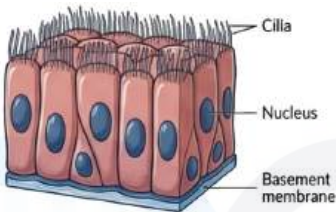
Mesoderm (Skeleton, Muscles, Circulatory system).



Endoderm (Lining of GI and Respiratory tracts).

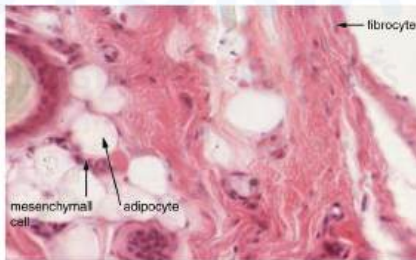
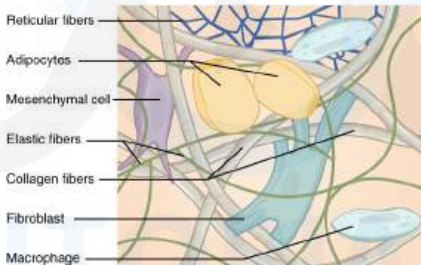
Four Fundamental Tissues Form the Fabric of the Human Body

Epithelial Tissue: "The Lining"



Tightly packed cells on a basement membrane. Functions: protection, secretion, absorption.

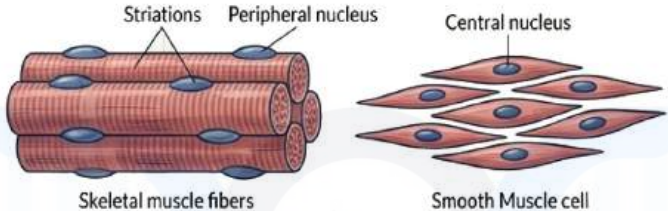
Connective Tissue: "The Support"



Cells within an extracellular matrix of fibers (collagen, elastic) and ground substance. Includes bone, cartilage, and blood.

Four Fundamental Tissues Form the Fabric of the Human Body

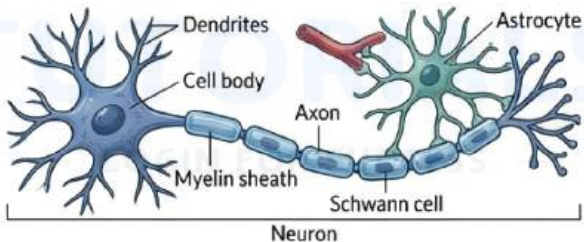
Muscle Tissue: "The Engine"



Specialized for contraction.

Types: Striated (Skeletal, Cardiac) and Non-striated (Smooth).

Nervous Tissue: "The Wiring"



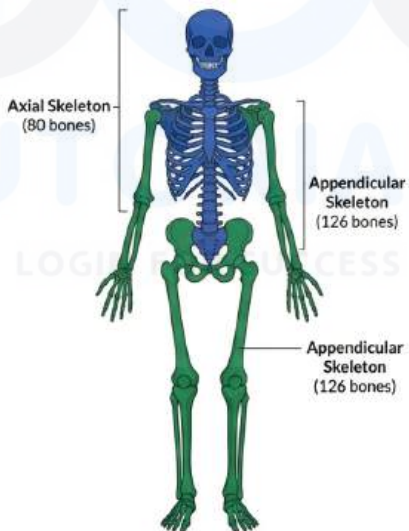
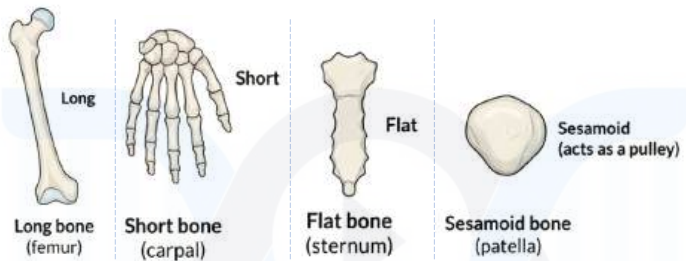
Composed of excitable neurons and supportive neuroglial cells (Astrocytes, Schwann cells).

Functions: communication and control.

The Skeleton Provides a Rigid Framework Articulated by Joints

Osteology (Bones)

Bone Classification by Shape

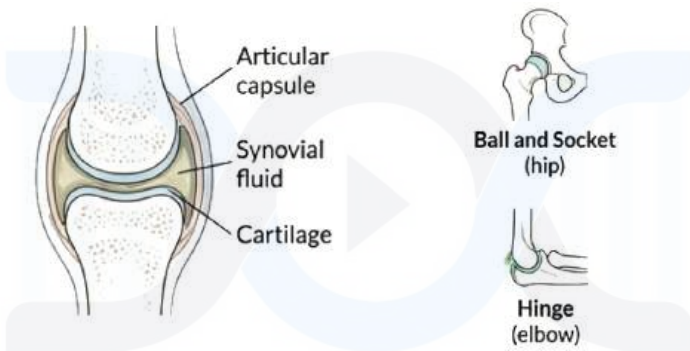


The Skeleton Provides a Rigid Framework Articulated by Joints

Arthrology (Joints)

Joints are classified by structure and mobility.

Key Type: Synovial Joints allow maximum mobility, characterized by a joint cavity and synovial fluid.

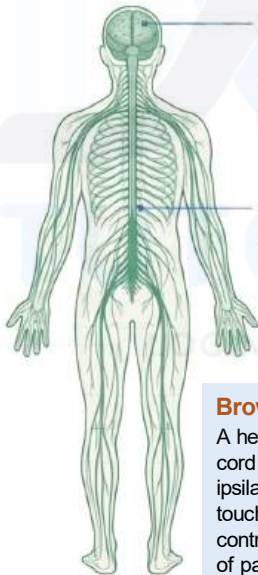
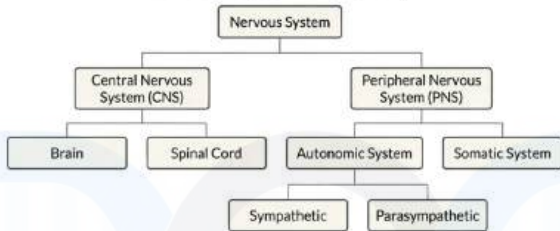


Site of Infection

The Metaphysis of a growing long bone is highly vascular but has hairpin-shaped vessels, causing blood stasis. This makes it a common site for osteomyelitis (bone infection).

The Nervous System Serves as the Body's Command and Control Network

Nervous System Hierarchy



CNS: The brain's cerebral cortex is organized into six layers. The spinal cord contains central gray matter (cell bodies) and peripheral white matter (axons).

Spinal Nerves: 31 pairs exit the spinal cord (8 cervical, 12 thoracic, 5 lumbar, 5 sacral, 1 coccygeal).

Brown-Sequard Syndrome

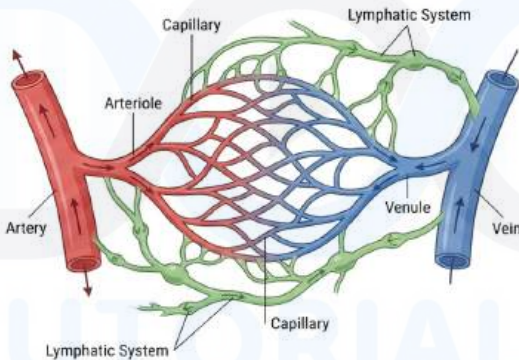
A hemisection (one-sided injury) of the spinal cord results in a distinct pattern: ipsilateral (same-side) loss of fine touch and motor function, with contra lateral (opposite-side) loss of pain and temperature sensation below the lesion.



Integrated Vascular and Lymphatic Networks Supply and Maintain the Body

Cardiovascular System

- Arteries: Carry oxygenated blood away from the heart. Thick tunica media.
- Arterioles: The primary "resistance vessels" that control blood pressure.
- Capillaries: The "exchange vessels" where nutrient and gas diffusion occurs at the tissue level.
- Veins: Return deoxygenated blood to the heart.



Lymphatic System

- A parallel drainage system that returns excess tissue fluid to the blood.
- Primary Organs (Bone Marrow, Thymus): Produce lymphocytes.
- Secondary Organs (Spleen, Lymph Nodes): Sites of immune response.

The "Widowmaker" Artery

The Left Anterior Descending (LAD) branch of the left coronary artery supplies a massive portion of the heart muscle. A 100% blockage is often fatal, earning it this clinical nickname.



The Thorax Protects the Heart and Lungs Within a Central Mediastinum

The Thoracic Wall

- Key Landmark: The Sternal Angle (Angle of Louis) at the T 4/TS level marks the division of the mediastinum and is used to locate the 2nd rib.
- Neurovascular Bundle: Runs in the intercostal spaces, arranged top to bottom: Vein, Artery, Nerve (VAN).



The Lungs & Pleura

- Right Lung: 3 lobes.
- Left Lung: 2 lobes and a lingula.
- Each lung is enclosed in a serous membrane called the pleura.



(b) Inferior view of transverse section of thoracic cavity

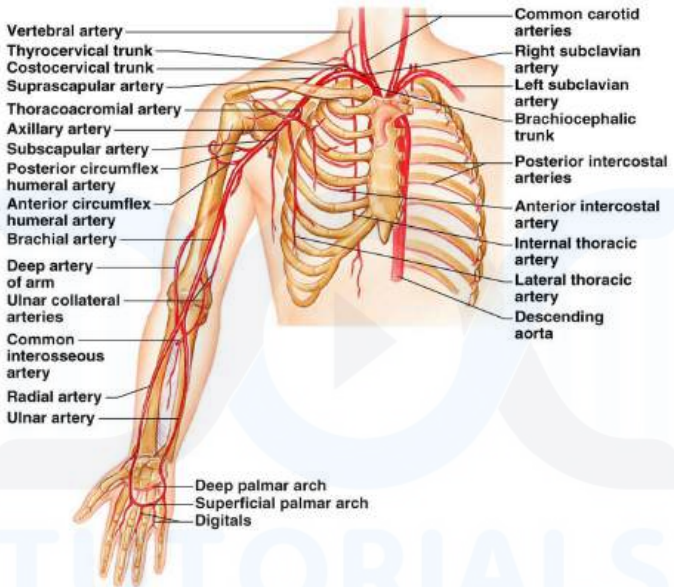


CLINICAL INSIGHT: Pleural Effusion

The costo-diaphragmatic recess is the lowest point of the pleural cavity. Excess fluid (pleural effusion) accumulates here first, making it a key site for diagnosis and drainage (thoracentesis).

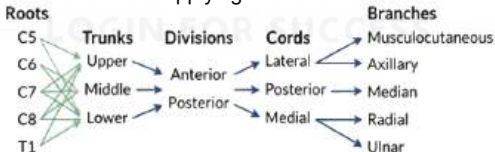


The Upper Limb is Engineered for Mobility and Precision



The Brachia! Plexus (C5-T1)

- A critical nerve network supplying the entire limb.



CLINICAL INSIGHT:

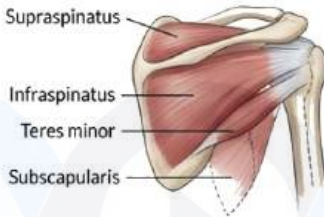
Injury to the upper trunk Clinical (CS, Note: C6) Injury causes to Erb the upper Palsy, resulting in the "waiter's tip" posture.



The Upper Limb is Engineered for Mobility and Precision

The Rotator Cuff (SITS)

- A musculotendinous cuff (Supraspinatus, Infraspinatus, Teres minor, Subscapularis) that stabilizes the highly mobile shoulder joint.



CLINICAL INSIGHT:

The Supraspinatus is the most commonly torn rotator cuff muscle



The Carpal Tunnel

- A narrow passage in the wrist formed by carpal bones and the flexor retinaculum.

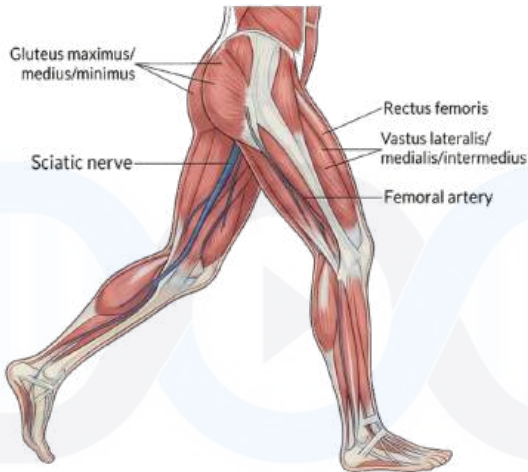


CLINICAL INSIGHT:

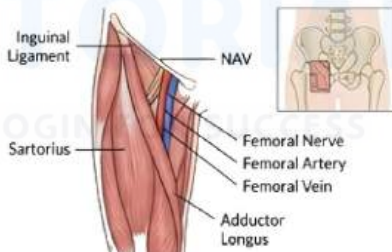
Compression of the median nerve here causes Carpal Tunnel Syndrome, leading to pain and wasting of the thenar muscles.



The Lower Limb Provides a Powerful Foundation for Support and Locomotion



Module 1: The Femoral Triangle

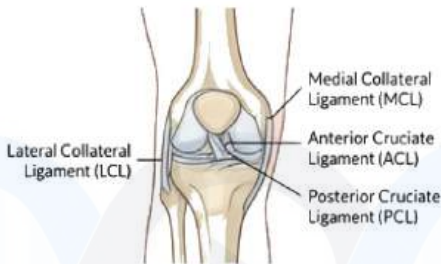


CLINICAL HIGHLIGHT:

The femoral canal, medial to the vein, is a weak spot and the site of femoral hernias.

The Lower Limb Provides a Powerful Foundation for Support and Locomotion

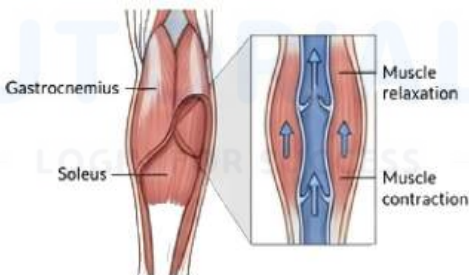
Module 2: The Knee Joint



CLINICAL HIGHLIGHT:

The "Unhappy Triad" is a common sports injury involving simultaneous damage to the ACL, MCL, and Medial Meniscus.

Module 3: The Calf Muscles



CLINICAL HIGHLIGHT:

The Soleus muscle in the posterior compartment acts as the "peripheral heart"; its contractions pumping venous blood back to the heart against gravity.

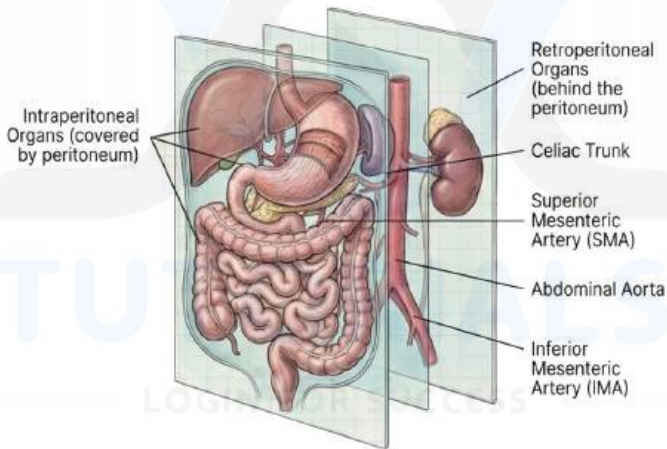
The Abdomen Houses the Viscera for Digestion and Metabolism

Organizational Principle: The Peritoneum

- A serous membrane lining the abdominal cavity. Organs are either Intraperitoneal (stomach, spleen) or Retroperitoneal (kidneys, pancreas).

Key Systems

- **Digestive:** Stomach, Small Intestine, Large Intestine.
- **Glands:** Liver (largest gland) and Pancreas.

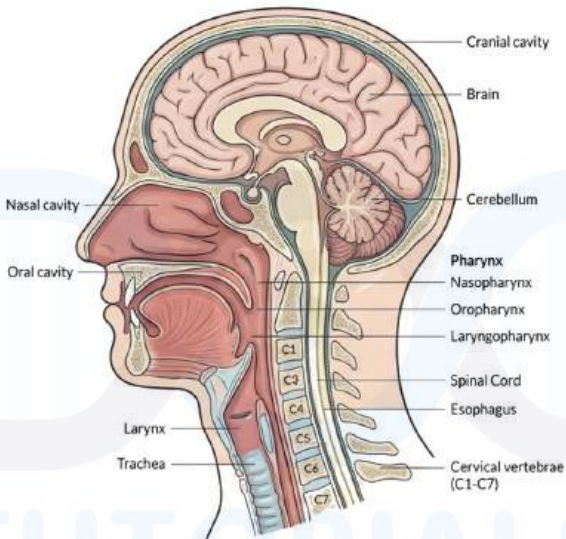


CLINICAL CORRELATION MODULE: PORTAL HYPERTENSION

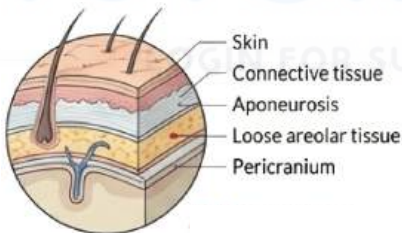
The portal vein brings 1200 ml/min of nutrient-rich blood to the liver. Obstruction (e.g., from cirrhosis) raises pressure, causing blood to divert through alternate routes, leading to esophageal varices and "caput medusae" (dilated veins around the umbilicus).



The Head and Neck House the Brain and Critical Neurovascular Pathways



Module 1: The Scalp

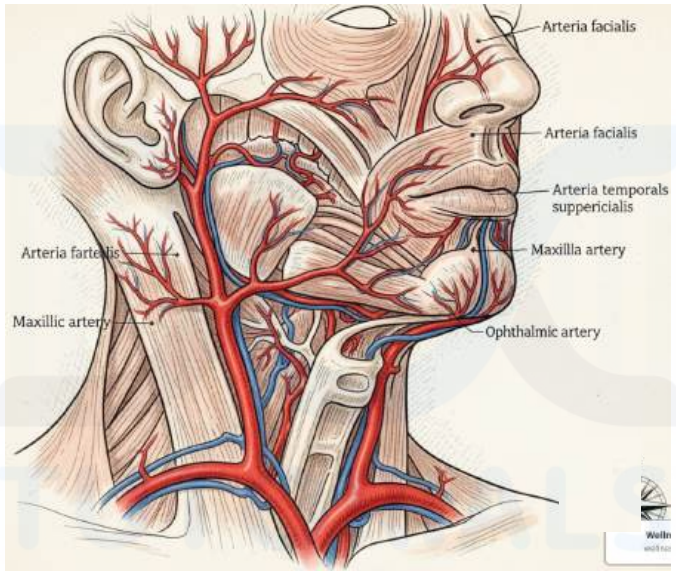


⚠️ Dangerous Layer

- Infection can spread via emissary veins from the loose areolar tissue to cranial sinuses.

The Head and Neck House the Brain and Critical Neurovascular Pathways

Module 2: The Neck



Module 3: The Cranial Cavity

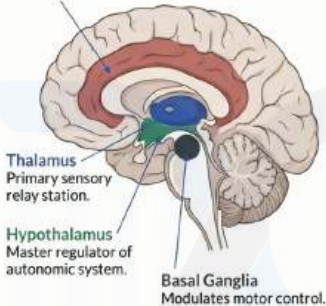


The Brain's Specialized Regions Govern Sensation, Homeostasis, and Motor Control

Functional Hubs

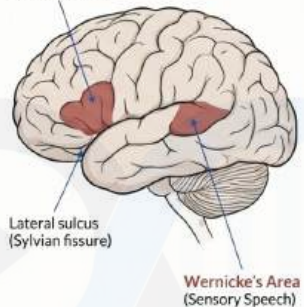
Limbic System

Controls "HOME": Homeostasis, Olfaction, Memory, and Emotion.



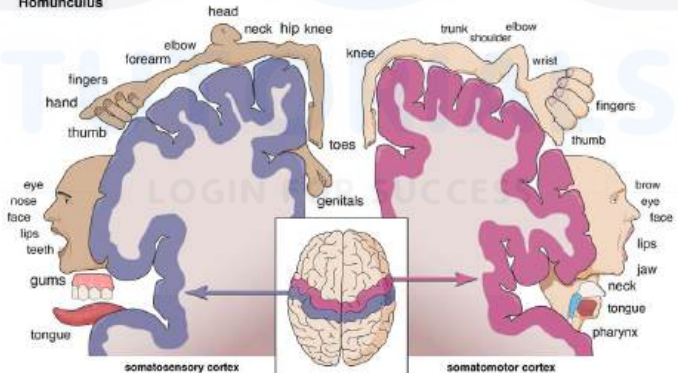
Cerebral Cortex

Broca's Area (Motor Speech)



Motor Control

Homunculus



The Primary Motor Area is mapped as the "Motor Homunculus," a distorted representation of the body where size corresponds to the degree of motor control.

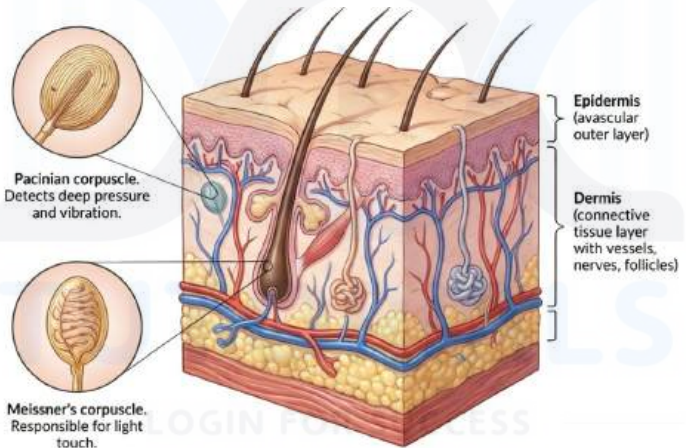
The Skin is a Multi-layered Organ for Protection, Sensation, and Regulation

Structure of the Skin

- Epidermis: The outer, avascular layer, composed of 5 distinct strata.
- Dermis: The deeper connective tissue layer containing blood vessels, nerves, hair follicles, and glands.

Fascia

- Superficial Fascia: Connects skin to the underlying deep fascia.
- Deep Fascia: A dense, organized connective tissue layer that envelopes muscles and organs.

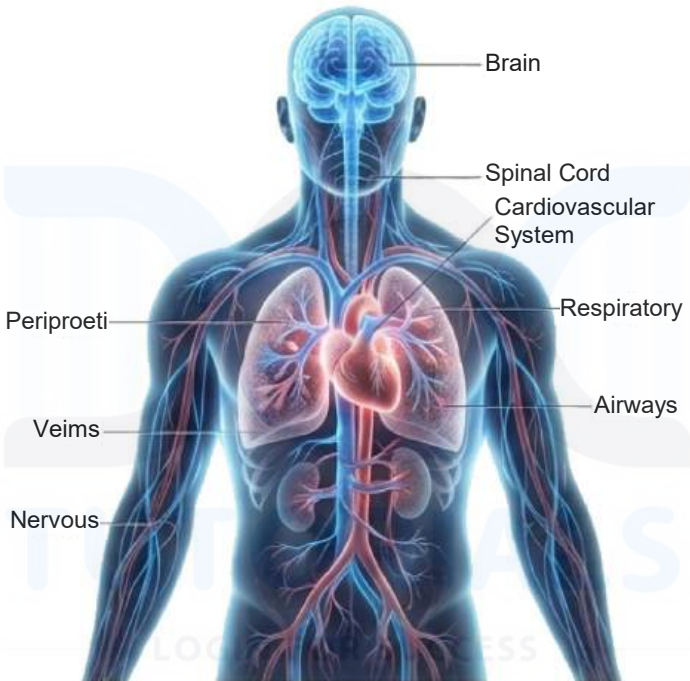


Peau d'orange

The breast is supported by the suspensory ligaments of Cooper. In breast cancer, tumor invasion can cause these ligaments to retract, pulling on the skin and creating a dimpled, orange-peel appearance known as 'peau d'orange'.



From a Genetic Code to a Conscious Being, Every System is Interconnected



The construction of the human body is a story of ascending complexity. It begins with a genetic blueprint, is assembled through a precise embryological process, built from four fundamental histological materials, and organized into an integrated network of functional systems. From the subcellular to the systemic, each level of organization informs the next, creating a dynamic, self-regulating whole.

NOTES



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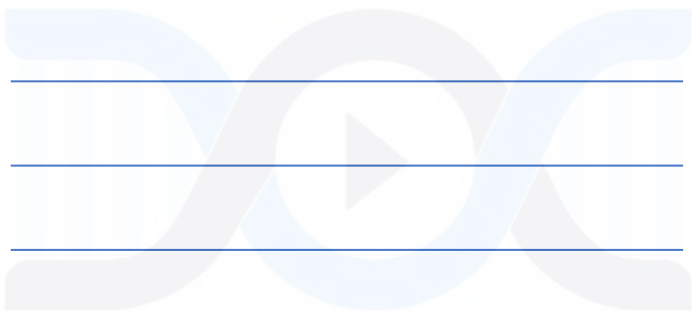
NOTES



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