ANATOMY OF BONE

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BONE (syn – Os; Osteon)

- Osseous tissue, a specialised form of dense connective tissue consisting of bone cells (osteocytes)
- Embedded in a matrix of calcified intercelluar substance
- Bone matrix contains collagen fibres and the minerals calcium phosphate and calciumcarbonate

FORMATION OF BONE

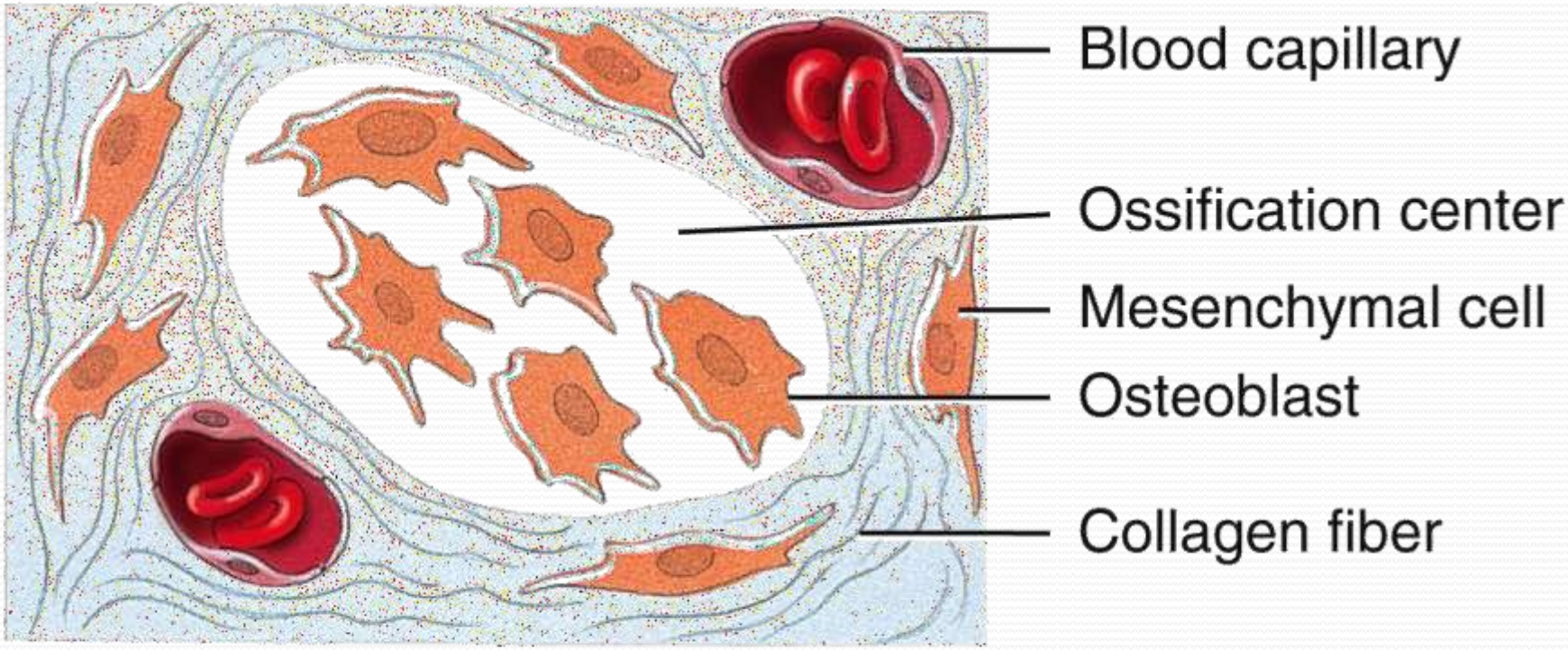
- The process of bone formation -ossificatiom
- All bone is of mesodermal origin
- Two types of ossification

1. Intramembranous ossification
2. Endochondral ossification

INTRAMEMBRANOUS OSSIFICATION

- Mesenchymal condensation
- Highly vascular
- Laying down of bundles of collagen fibres in the mesenchymal condensation
- Osteoblast formation – OSTEOID
- Calcium salts deposition – lamellus of bone

BONE FORMATION- **Intramembranous ossification**



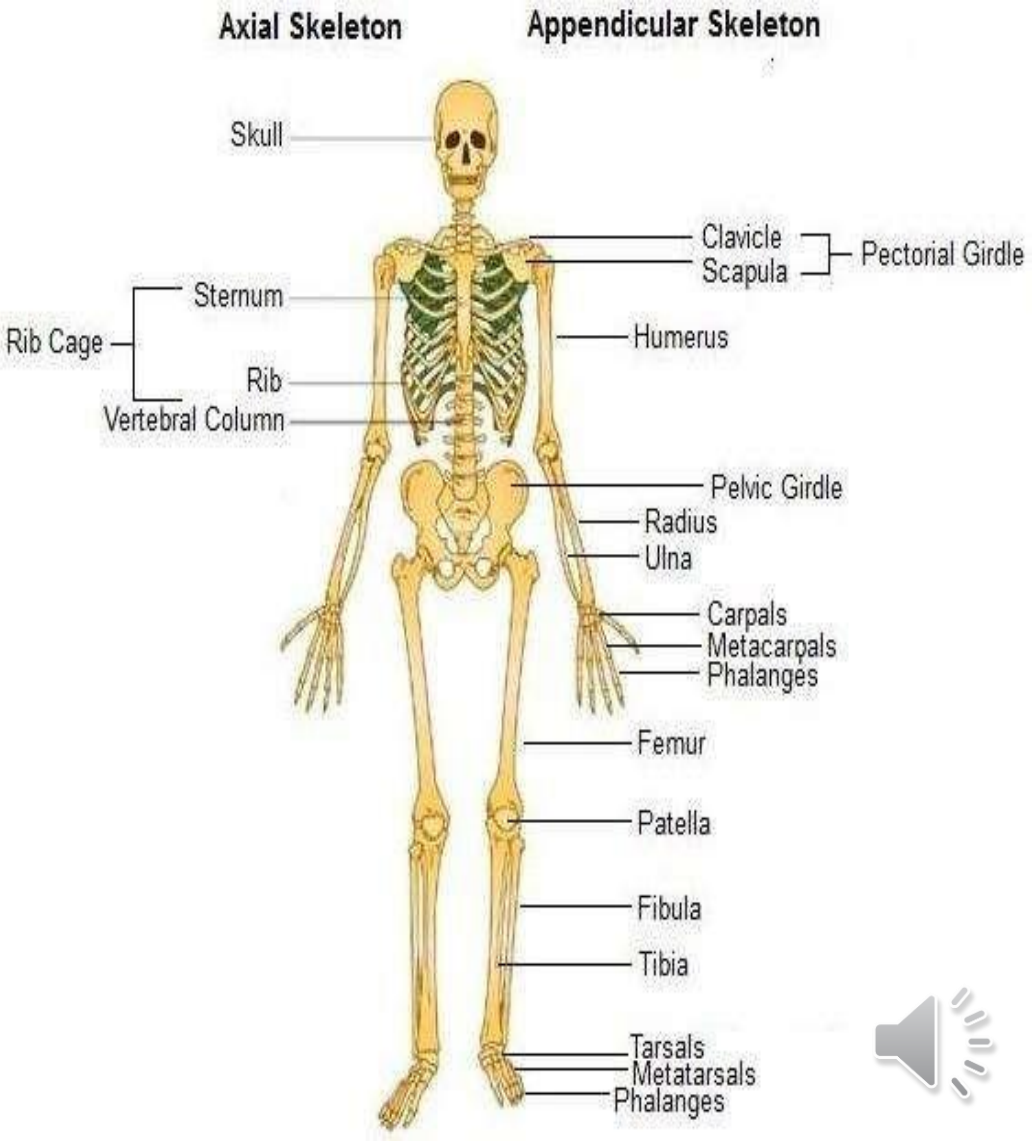
1. Development of ossification center: osteoblasts secrete organic extracellular matrix

SKELETAL ORGANIZATION

- The actual number of bones in the human skeleton varies from person to person
- Typically there are about 206 bones
- For convenience the skeleton is divided into the:
  - Axial skeleton
  - Appendicular skeleton

DIVISION OF SKELETON

- Axial Skeleton
  - Skull
  - Spine
  - Rib cage
- Appendicular Skeleton
  - Upper limbs
  - Lower limbs
  - Shoulder girdle
  - Pelvic girdle

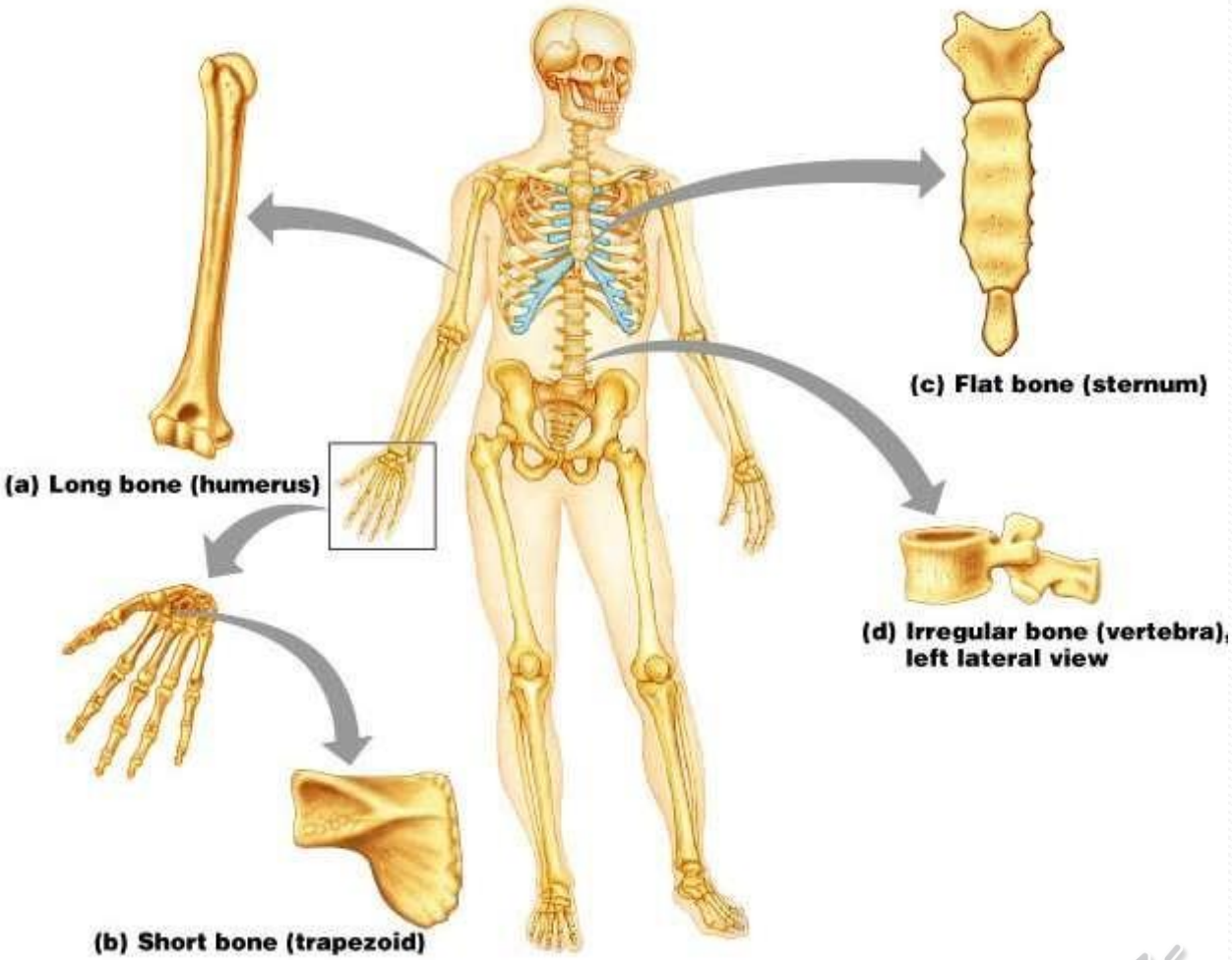


CLASSIFICATION OF BONE

- Based On Shape
- Developmental
- Structural (Macroscopic)
- Histological (Microscopic)

CLASSIFICATION OF BONES BY SHAPE

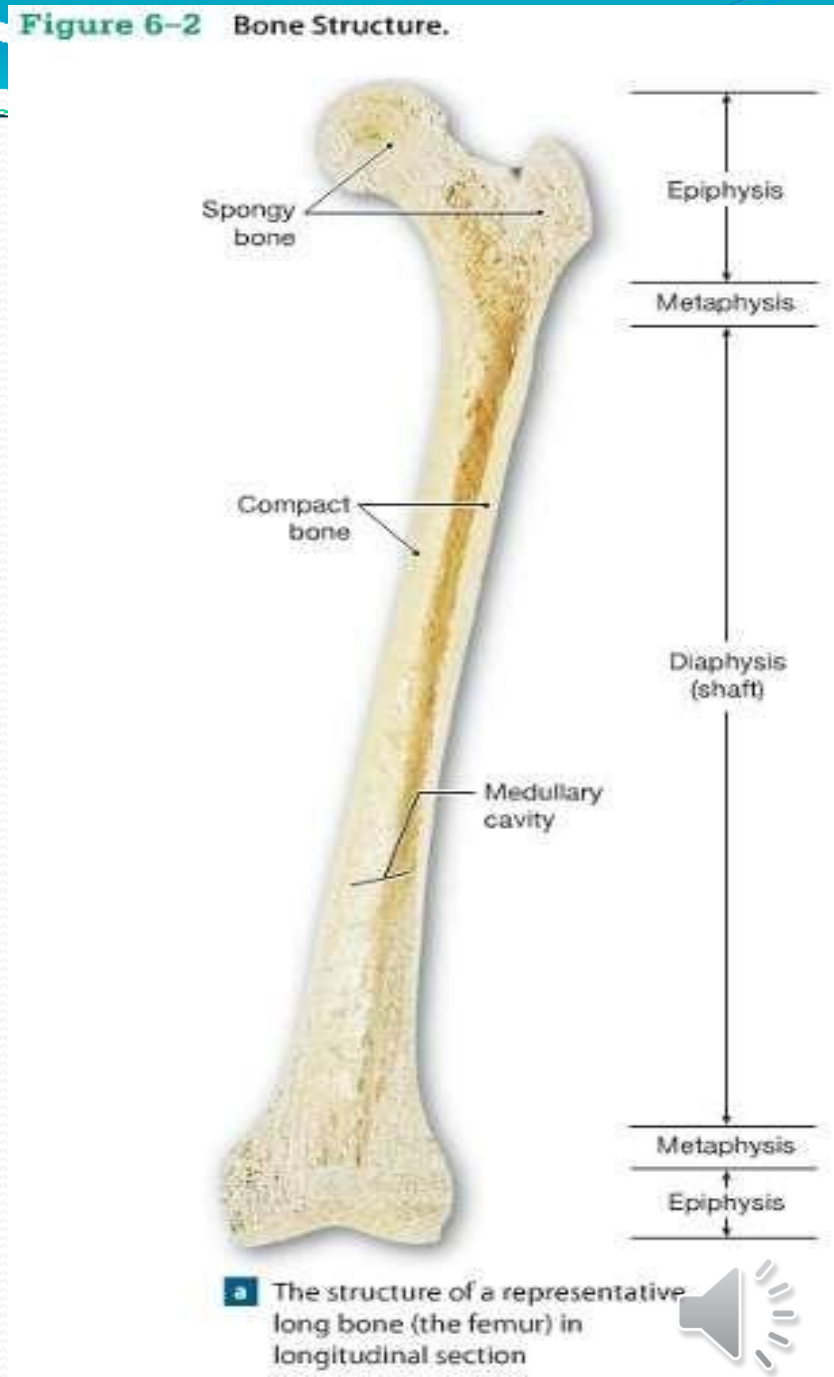
- Long bones
- Short bones
- Flat bones
- Irregular bones
- Pneumatized bones
- Sesamoid bones



(Short bones include sesmoid bones)

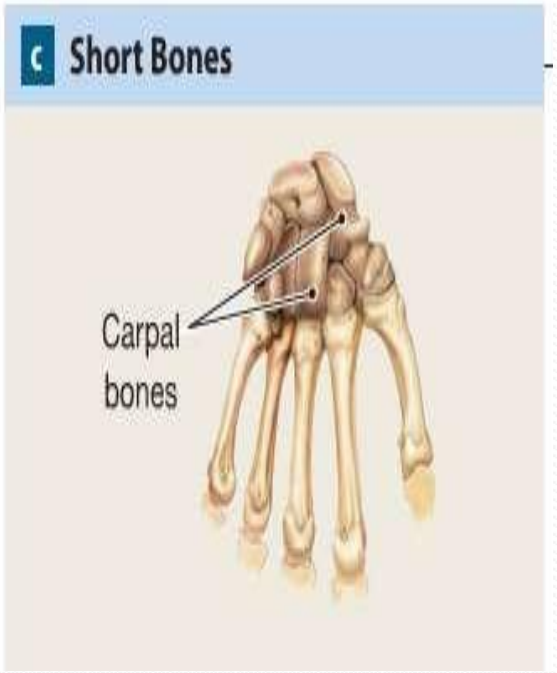
LONG BONES

- Diaphysis – shaft
- Epiphysis – expanded ends
- Shaft – 3 surfaces, 3 borders, medullary cavity and a nutrient foramen directed away from the growing end
- Ex – Humerus, Radius, Ulna, Femur, etc



SHORT BONES

- Are small and thick
- Their shape is usually cuboid, cuneifrom, trapezoid or scaphoid
- Ex – carpal and tarsal bones



FLAT BONES

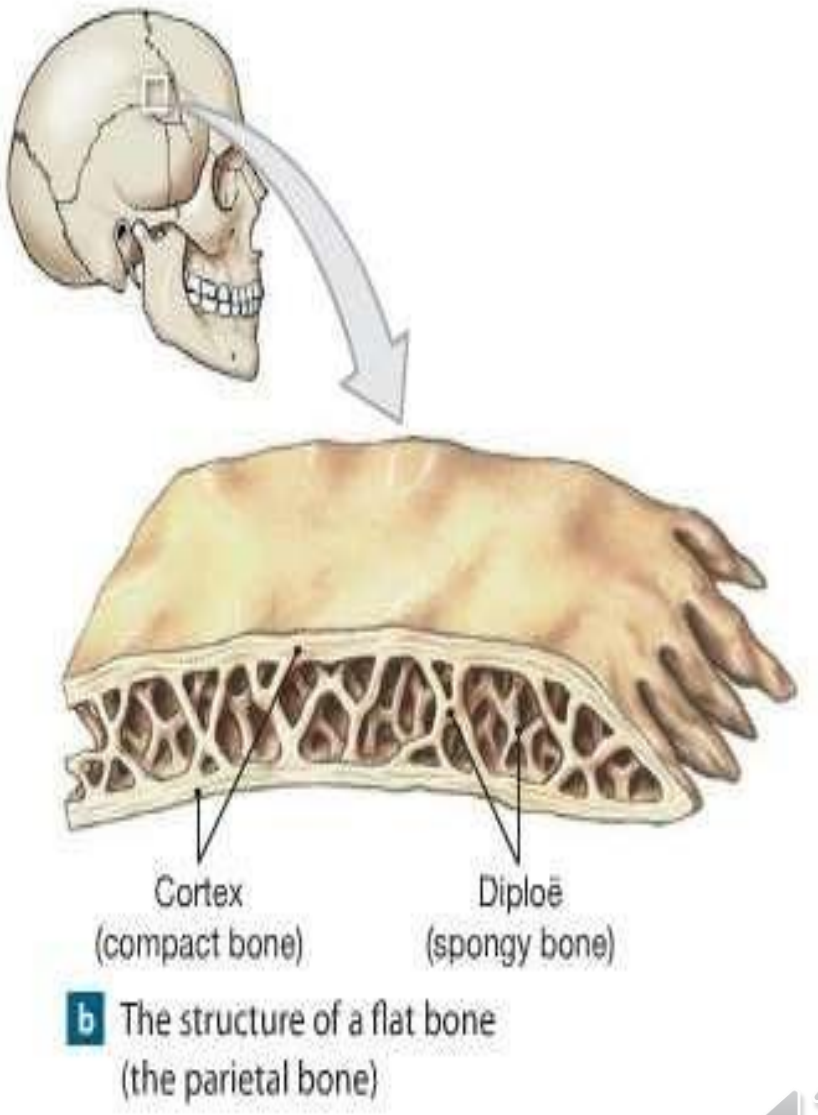
- Are thin with parallel surfaces

  • Are found in the Skull, Sternum, Ribs, and Scapula

- Form boundaries of certain body cavities

  •Resembles a sandwich of spongy bone

  •Between 2 layers of compact bone



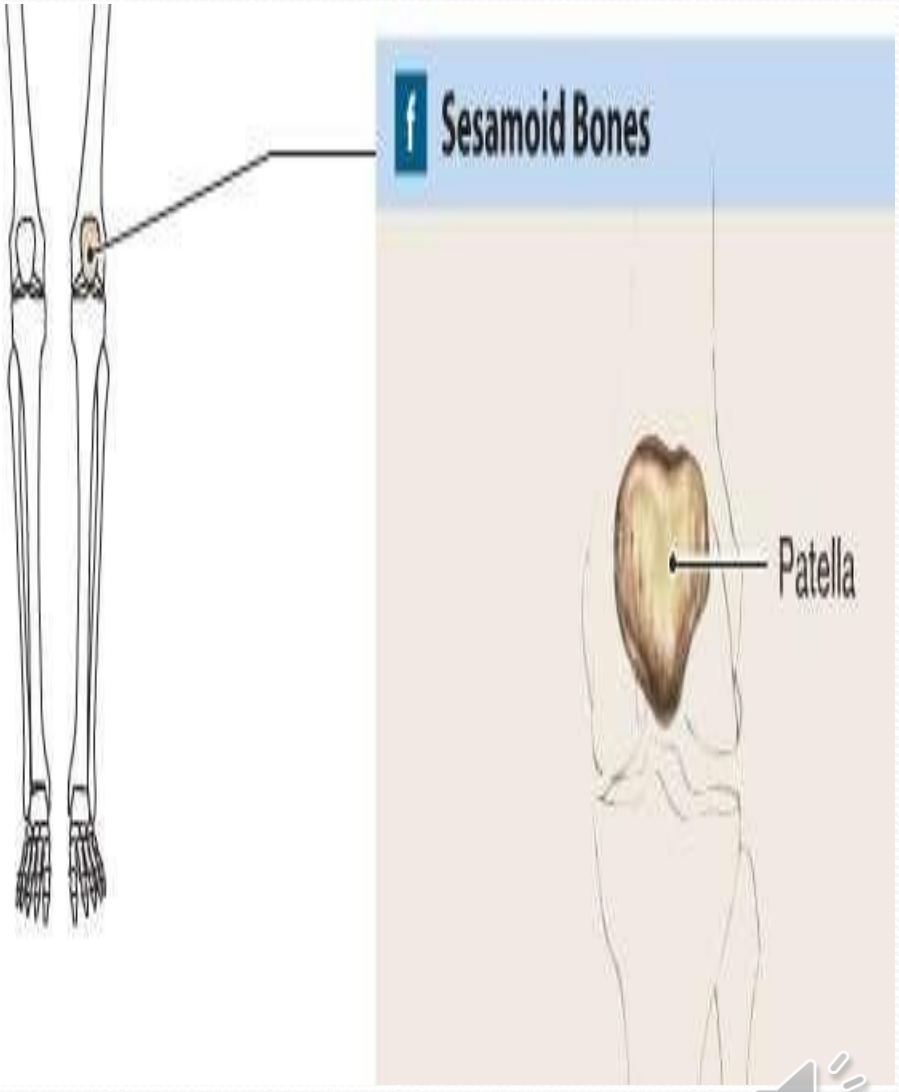
b The structure of a flat bone (the parietal bone)

PNEUMATIC BONES (Gr. – pert. to air)

- Certain irregular bones contain large air spaces lined by epithelium
- Make the skull light in weight, help in resonance of voice, and act as air conditioning chambers for inspired air
- Ex – Maxilla, Sphenoid, Ethmoid, etc

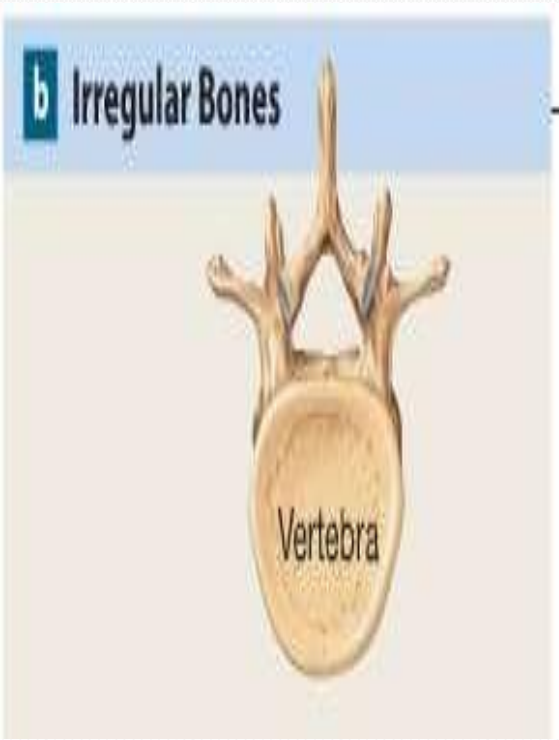
SESAMOID BONES

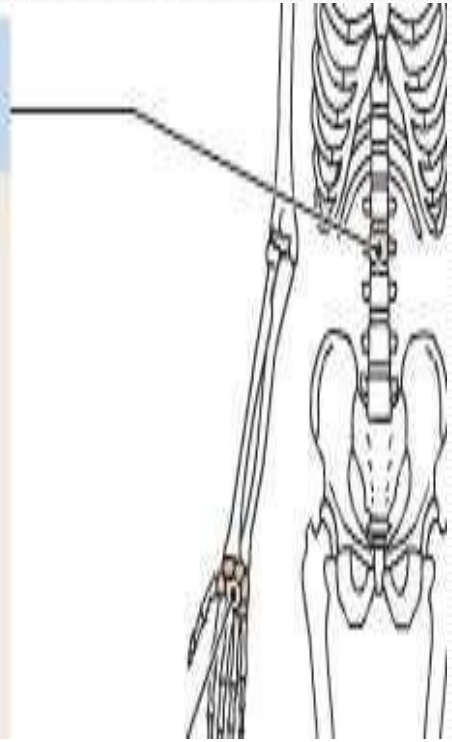
- Resembling a grain of sesame in size or shape
- Bony nodules found embedded in the tendons or joint capsules
- No periosteum and ossify after birth
- Related to an articular or nonarticular bony surface
- Ex – Patella, Pisiform, Fabella, etc
- Functions

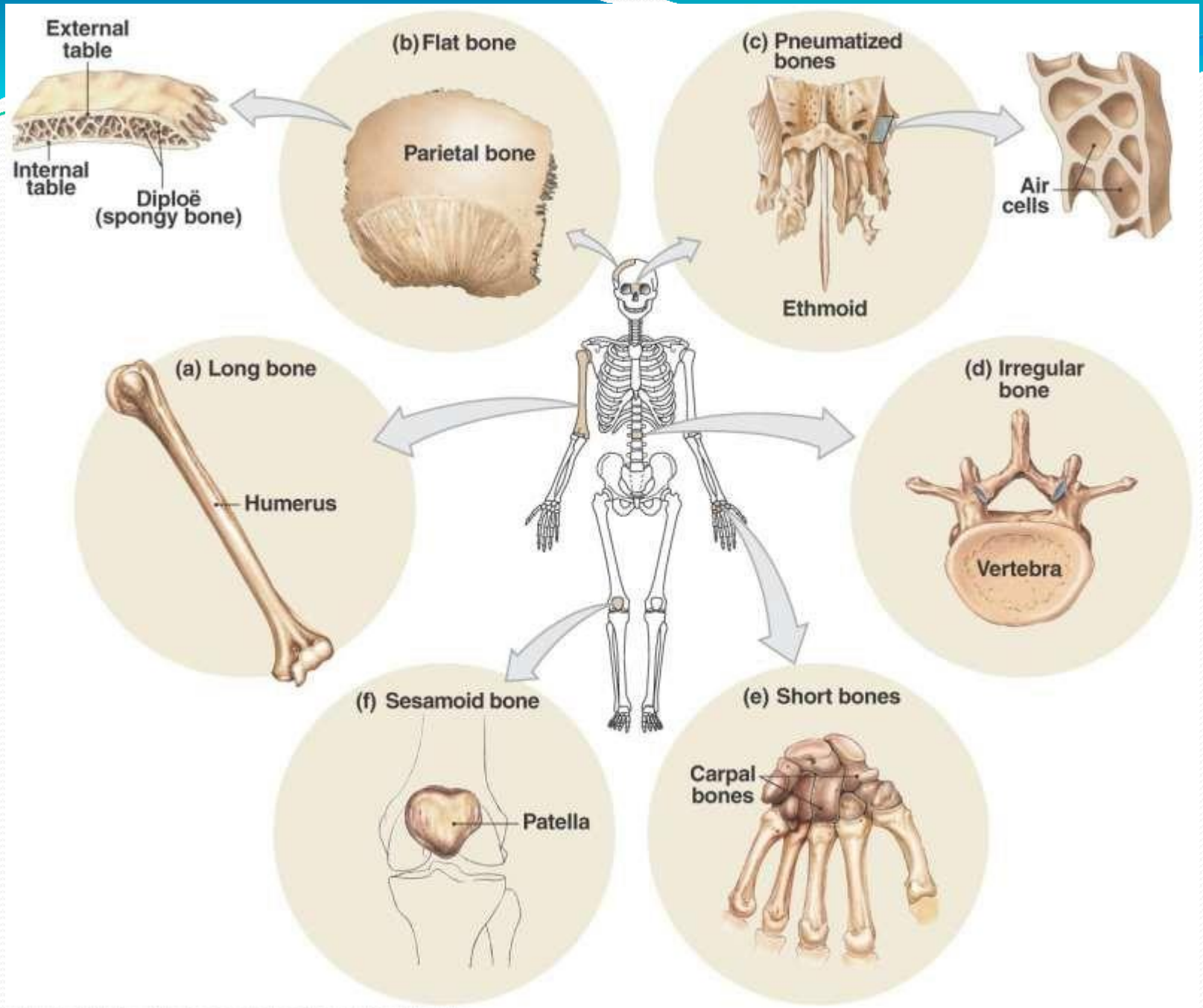


IRREGULAR BONES

- Have complex shapes
- Examples:
  - Spinal Vertebrae
  - Pelvic Bones







DEVELOPEMENTAL CLASSIFICATION

- Membrane (dermal) bones
- Cartilaginous bones
- Membrano-cartilagenous bones

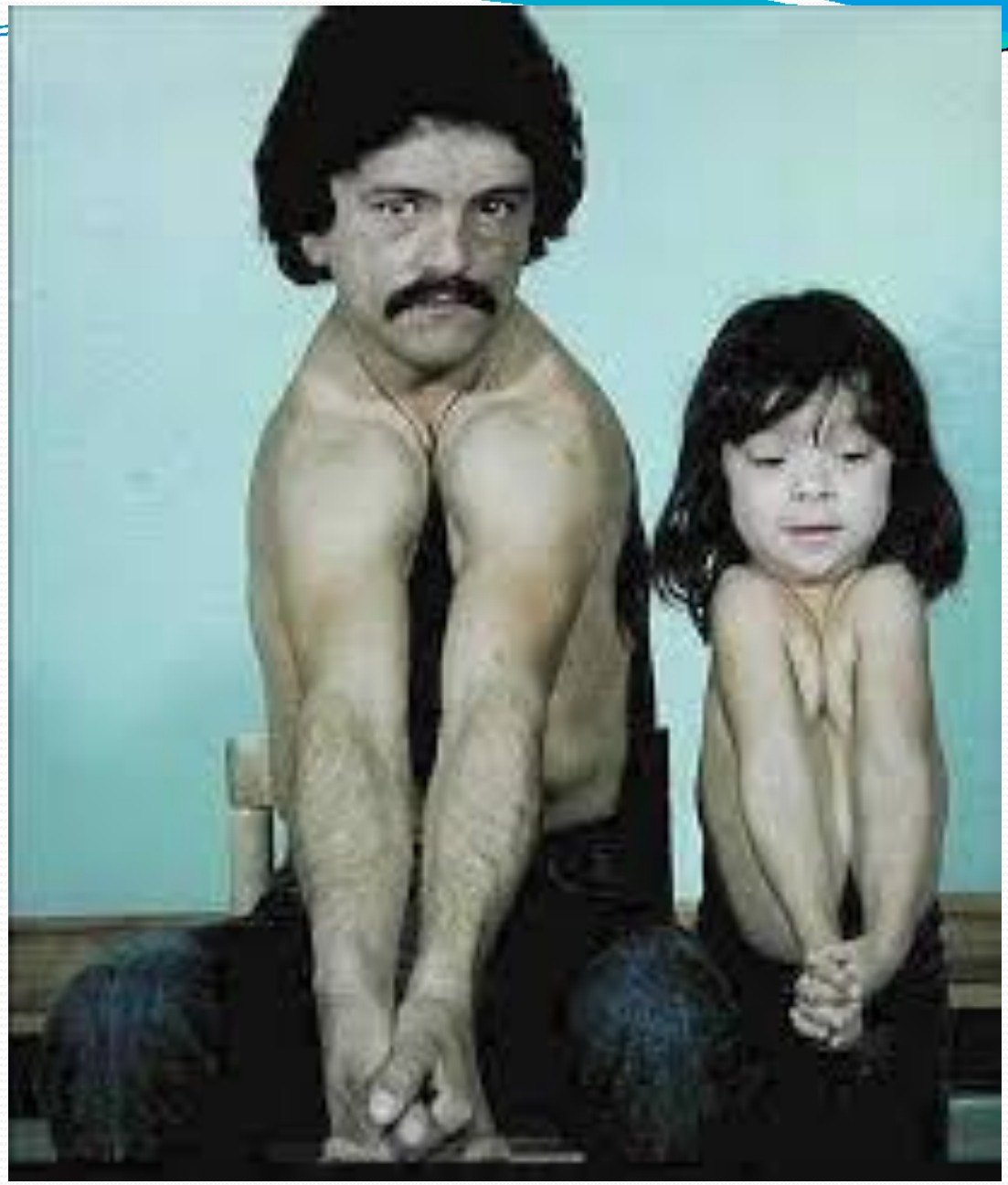
Membrane (dermal) bones

- Ossify in membrane (intramembranous of mesenchymal)
- Derived from mesenchymal condensations
- Ex – bones of the vault of skull and facial bones
- Defect – Cleidocranial Dysostosis

Overview of CCD

Cleidocranial Dysostosis (CCD):

- CCD is an inherited disorder of bone development [1-6]
- Characterized by absent or incomplete formed collarbone [1-6]
- Abnormal shape of skull with depression of sagittal suture [1-6]
- Characteristic facial appearance [1-6]
- Short stature and dental abnormalities [1-6]
- Affected chromosomes 6 and 18 [1-6]



Cartilaginous bones

- Ossify in cartilage (intracartilagenous or endochondral)
- Derived from preformed cartilaginous models
- Ex – bones of limbs, vertebral column and thoracic cage
- Defect – common type of dwarfism called Achondroplasia

What is Achondroplasia?

- Achondroplasia is an **autosomal dominant** condition
- It was discovered in 1994 by Dr. John Wasmuth
- It is caused by a **mutation** of the **fibroblast growth factor receptor-3 (FGFR3) gene on chromosome 4.**
- Achondroplasia is the most common form of Dwarfism
- Although there are over **200 types** of dwarfism, **two-thirds** have achondroplasia
- It affects 1 in 25,000
- 30,000 to 50,000 in U.S. have some form of Dwarfism
- It occurs in both sexes and all races
- Motor skills are temporarily delayed
- Cognitive skills/intelligence levels are **not** affected

Gigantism

- "Pituitary gigantism" and Hypersecretion of the GH
- Bone growth in an excess amount
- Can result in "hoarseness, sleep apnea, joint pain, cardiovascular disease, hypertension, Insulin resistance, visual impairment and severe headaches" (MedNet, 1)

Tallest Man to ever Live: Robert Wadlow. 8'11.1", lived to age 22

Membrano-cartilaginous bones

- Ossify partly in cartilage and partly in membrane
- Ex – clavicle, mandible, occipital, etc

Thank You