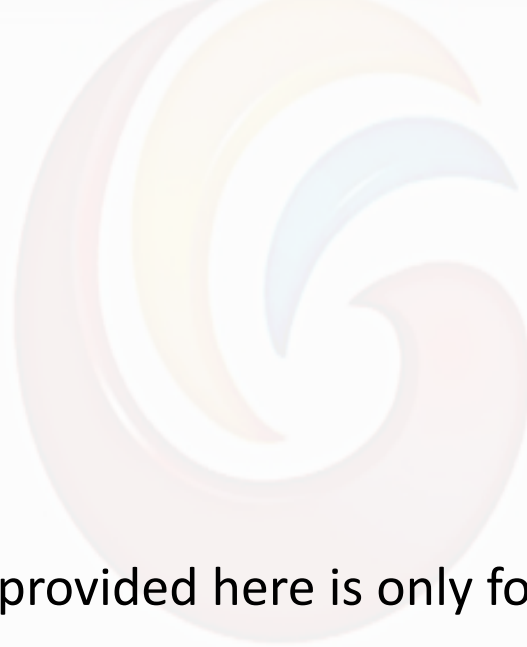


The logo of Galgotias University is a stylized 'G' composed of three curved, overlapping bands in shades of yellow, blue, and red, set against a light pink circular background.

Anatomy of bone

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BONE ANATOMY

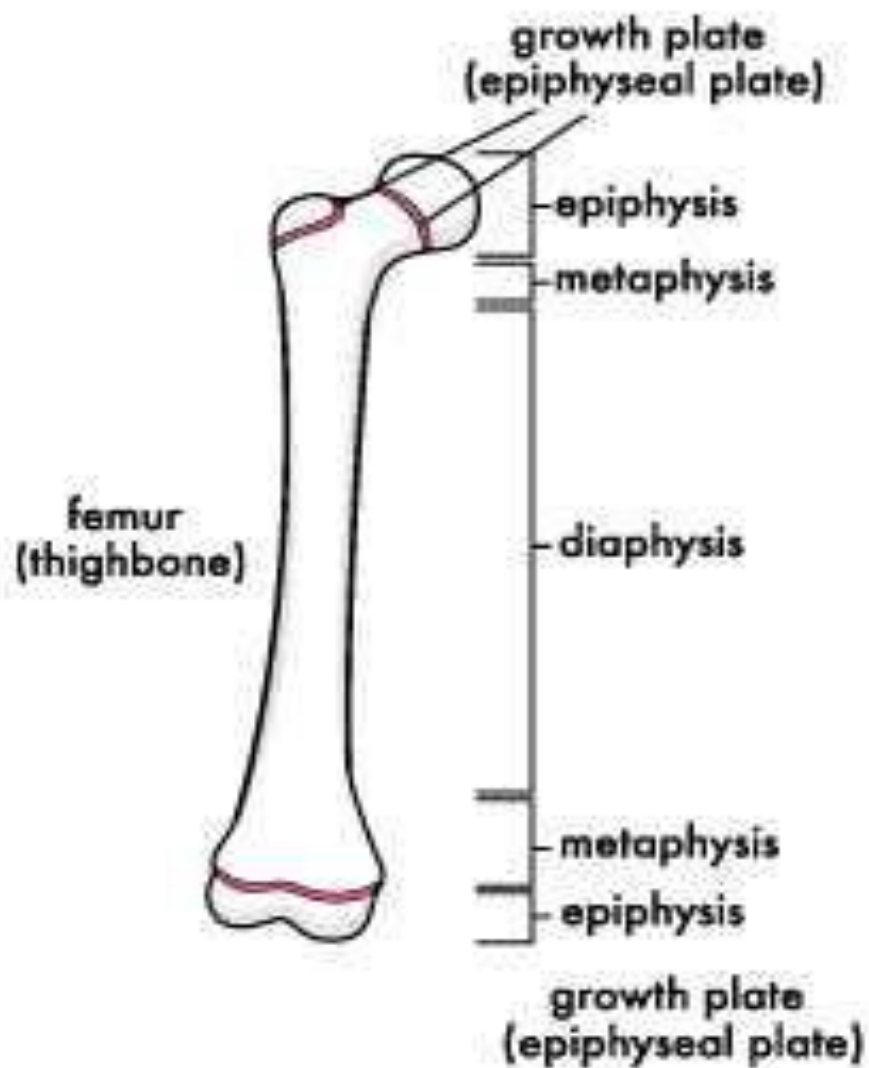
- On the basis of shape bones may be classified in to four types:
 - 1. Long bone
 - 2. Short bone
 - 2. Flat bone
 - 3. Irregular bone

A large, faint watermark logo of Galgotias University is centered on the slide. It features a stylized 'G' composed of three curved, overlapping bands in shades of yellow, blue, and red.

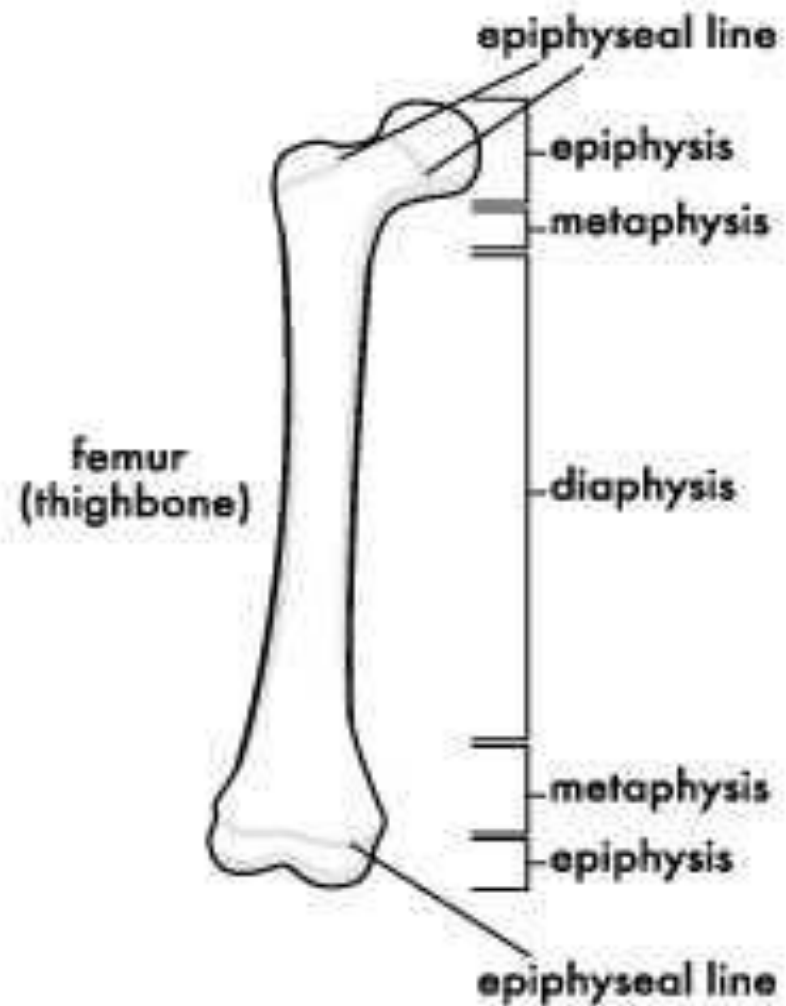
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Structure of a Typical long bone

- Has two ends or EPIPHYSES(singular epiphysis)
- An intermediate portion called the shaft or diaphysis.
- Part of shaft which adjoins an epiphysis is called METAPHYSIS- one next to each epiphysis.
- There is a thin plate of growth cartilage, one at each end, separating the epiphysis from the metaphysis, called EPIPHYSEAL PLATE.

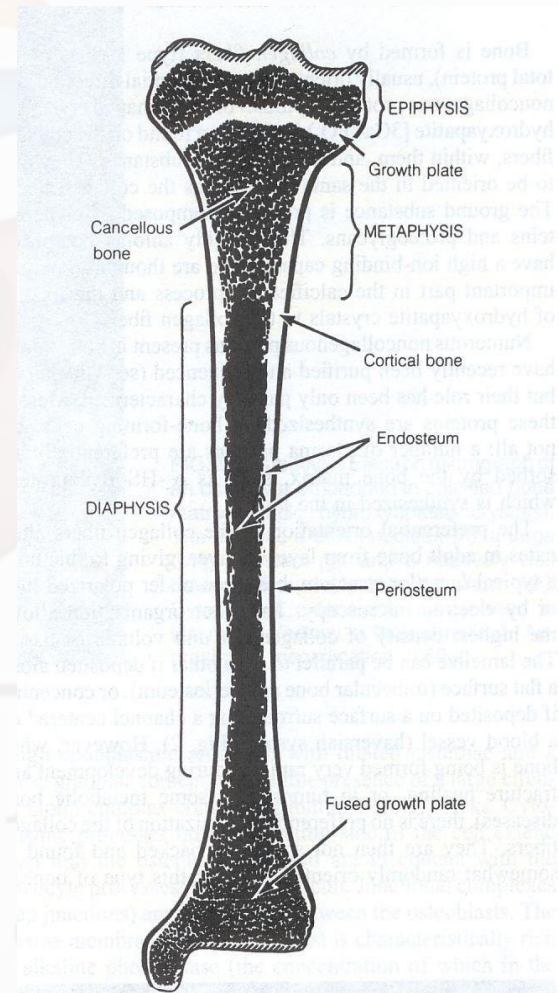


growing long bone



mature long bone

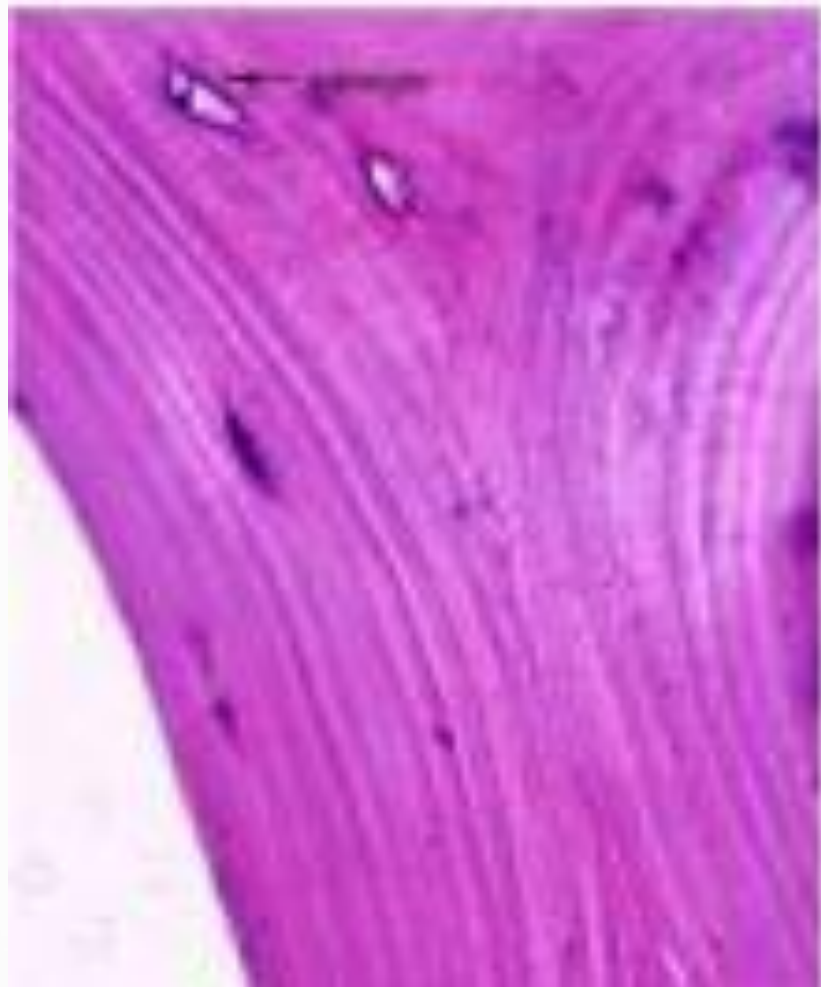
- At maturity epiphysis fuses with metaphysis and epiphyseal plate is replaced by bone.
- The articular ends of the epiphyses are covered with articular cartilage
- The rest of the bone is covered with periosteum which provides attachment to tendons, muscles, ligaments etc.
- The strands of fibrous tissues connecting the bone to the periosteum are called **Sharpe's fibers**.



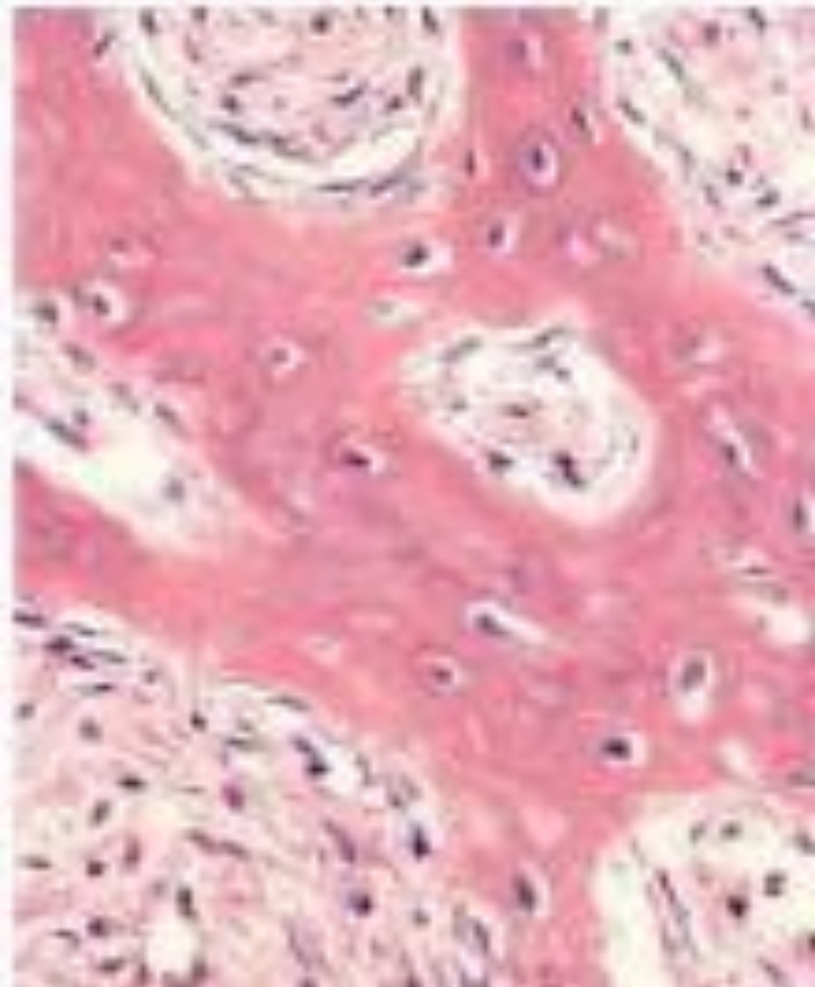
Classification based on Microscopic structure

- 1. Woven bone or immature bone
- 2. Lamellar bone or mature bone
- Woven bone is characterized by random arrangement of cells and collagen
- Lamellar bone has an orderly cellular distribution and properly oriented collagen fibres.
- Woven bone is associated with periods of rapid bone formation, such as in the initial stages of fracture healing.
- Lamellar bone is what constitutes an organised bone-both cortical and cancellous

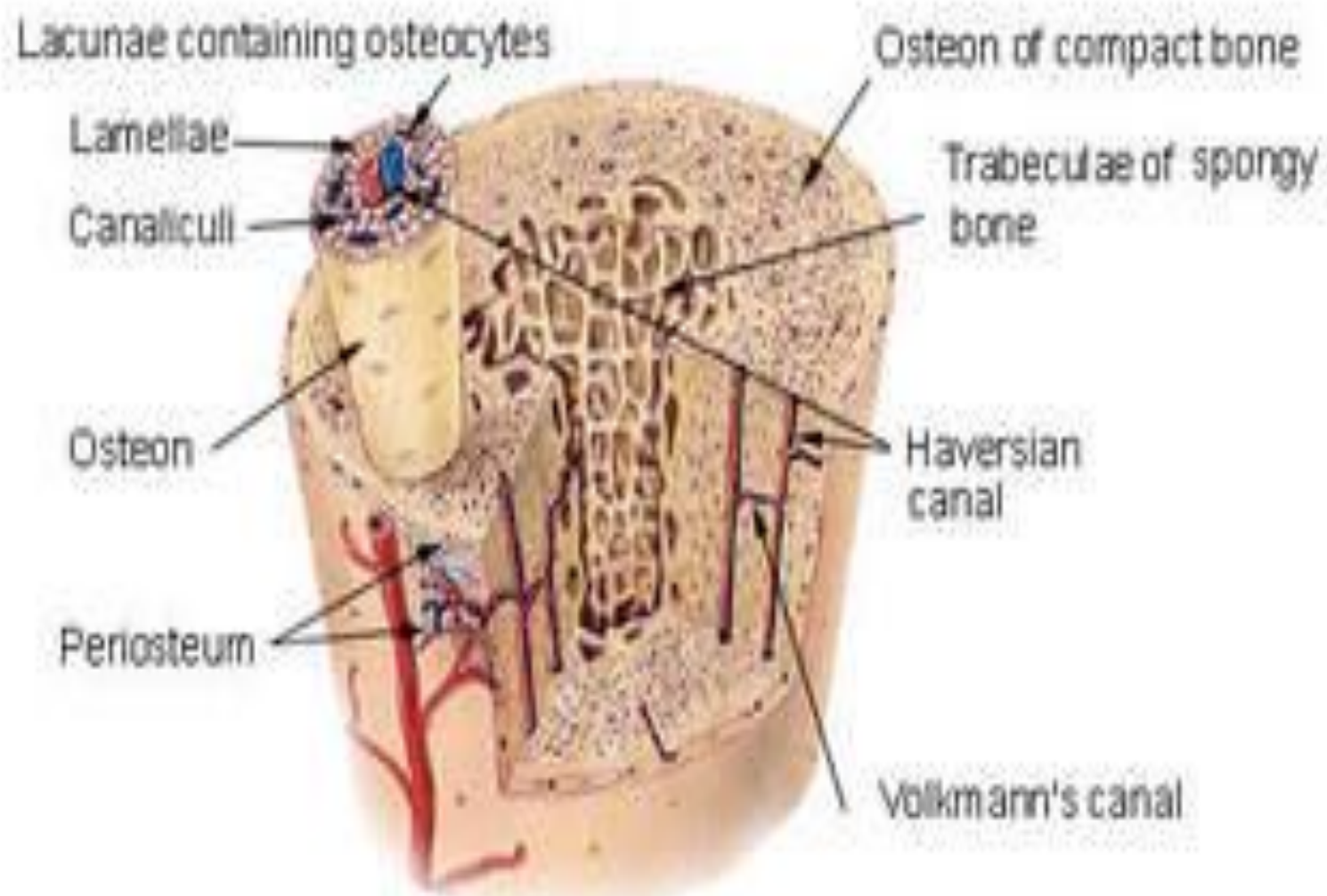
Lamellar Bone



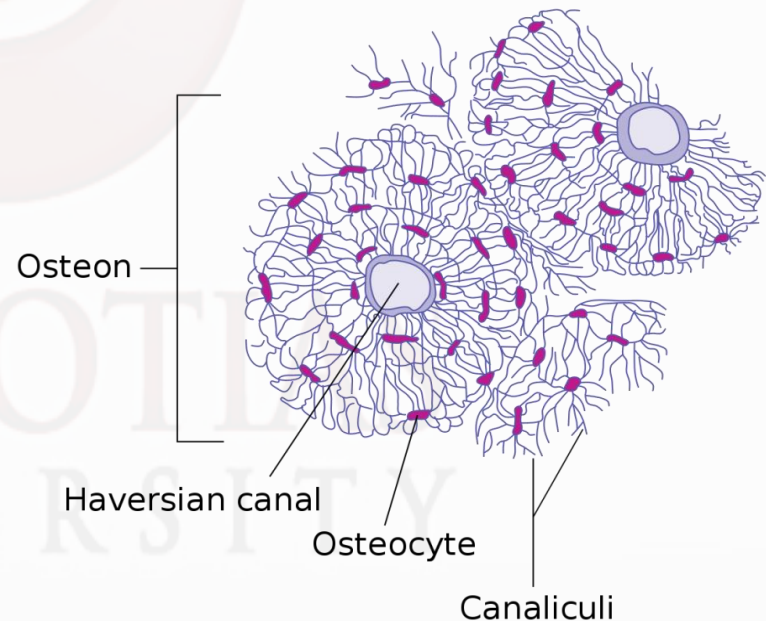
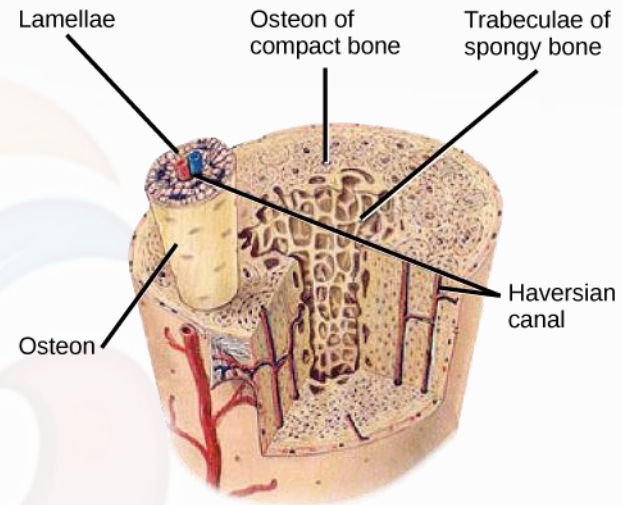
Woven Bone



Compact Bone & Spongy (Cancellous Bone)



- The basic structural unit of lamellar bone is the osteon.
- It consists of a series of concentric laminations or lamellae surrounding a central canal, the Haversian canal.
- These canals run longitudinally and connect freely with each other and with Volkmann's canals.



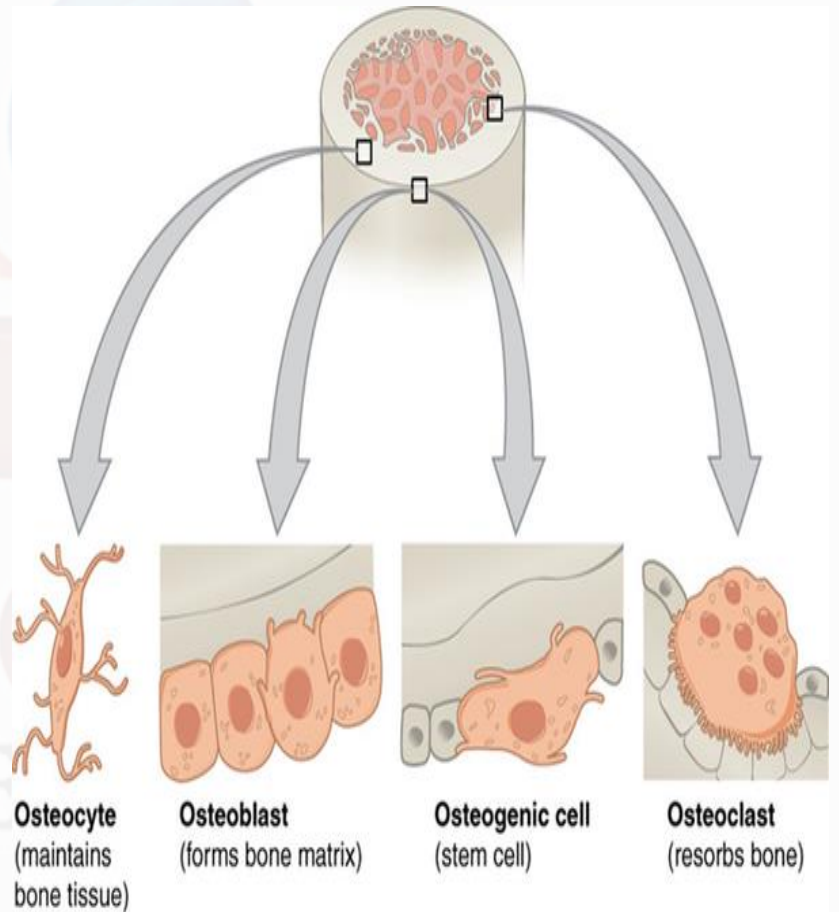
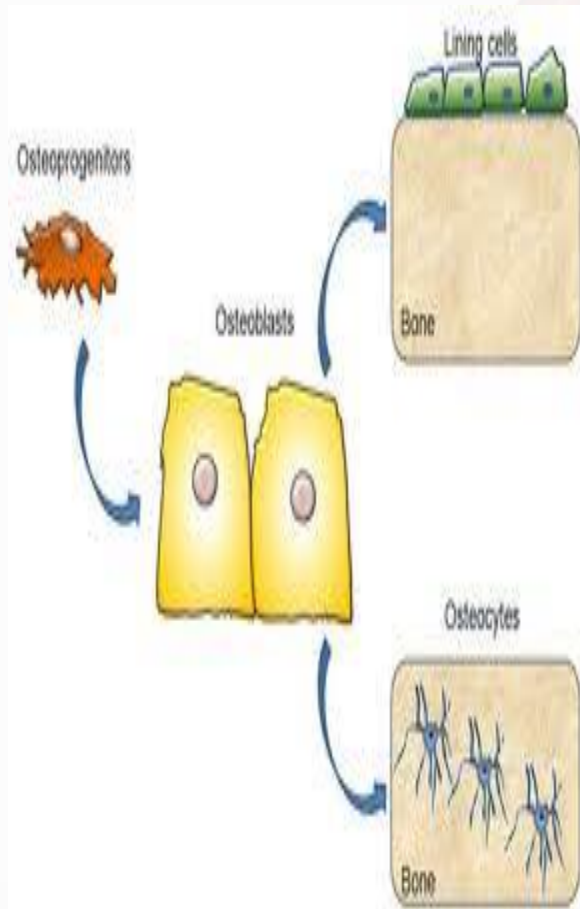
- Volkmann's canal run horizontally from endosteal to periosteal surfaces.
- The lamellae may be arranged densely to form the cortical bone, or loosely to form the cancellous bone.
- Ends of bone are cancellous bone
- Junction between the two bones, termed the CORTICOCANCELLOUS junction.
- This junction is common site of fracture.

Structural composition of bone

- Bone is made up of bone cells and extracellular matrix.
- The matrix consists of two types of materials –organic and inorganic.
- Organic matrix is formed by the collagen, which forms 30-35 percent of dry weight of a bone.
- The inorganic matrix is primarily calcium and phosphorus salts, especially hydroxyapatite $[\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2]$.
- It constitutes about 65-70 percent of dry weight of bone.

Bone Cells

- 3 Main types in the bone:
 - 1. **Osteoblasts**:
 - 2. **Osteocytes**
 - 3. **Osteoclasts**
- **OSTEOBLASTS** are the cells that form new bone.
- They also come from the bone marrow and are related to structural cells.
- They have only one nucleus. **Osteoblasts** work in teams to build bone.
- They produce new bone called "osteoid" which is made of bone collagen and other protein.



Osteocytes and Osteoclasts

- *Osteocytes* are simply osteoblasts trapped in the matrix that they secrete.
- They are networked to each other via long cytoplasmic extensions that occupy tiny canals called canaliculi, which are used for exchange of nutrients and waste through gap junctions
- *Osteoclasts* are specialized multinucleated giant cells that resorb bone.
- This is carried out primarily due to remodeling of extracellular matrix

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