

2- Bone

Lec 2

Is a rigid form of c.t. that constitutes most of the skeleton of higher vertebrates. It consists of cells and an intercellular matrix. The matrix contains an organic component, chiefly collagenous fibers, and an inorganic component which accounts for the hardness and rigidity of bone include calcium phosphate (85%), calcium carbonate (10%) and small amounts of calcium fluoride and magnesium fluoride.

There are two types of bone:

A- The spongy bone consists of slender, irregular trabeculae that branch and unit with one another to form a meshwork , the intercommunicating spaces of which are filled with bone marrow.

B- Compact bone appears solid and the differences between the two types depend merely upon the relative amount of solid matter and the size and number of spaces in each. Both spongy and compact types are present in every bone, but the amount and distribution of each vary considerably.

Each bone, except over its articular surfaces is enveloped by a specialized c.t. coat the periosteum. A similar , but less well developed c.t. layer, the endosteum lines the marrow cavity and marrow spaces.

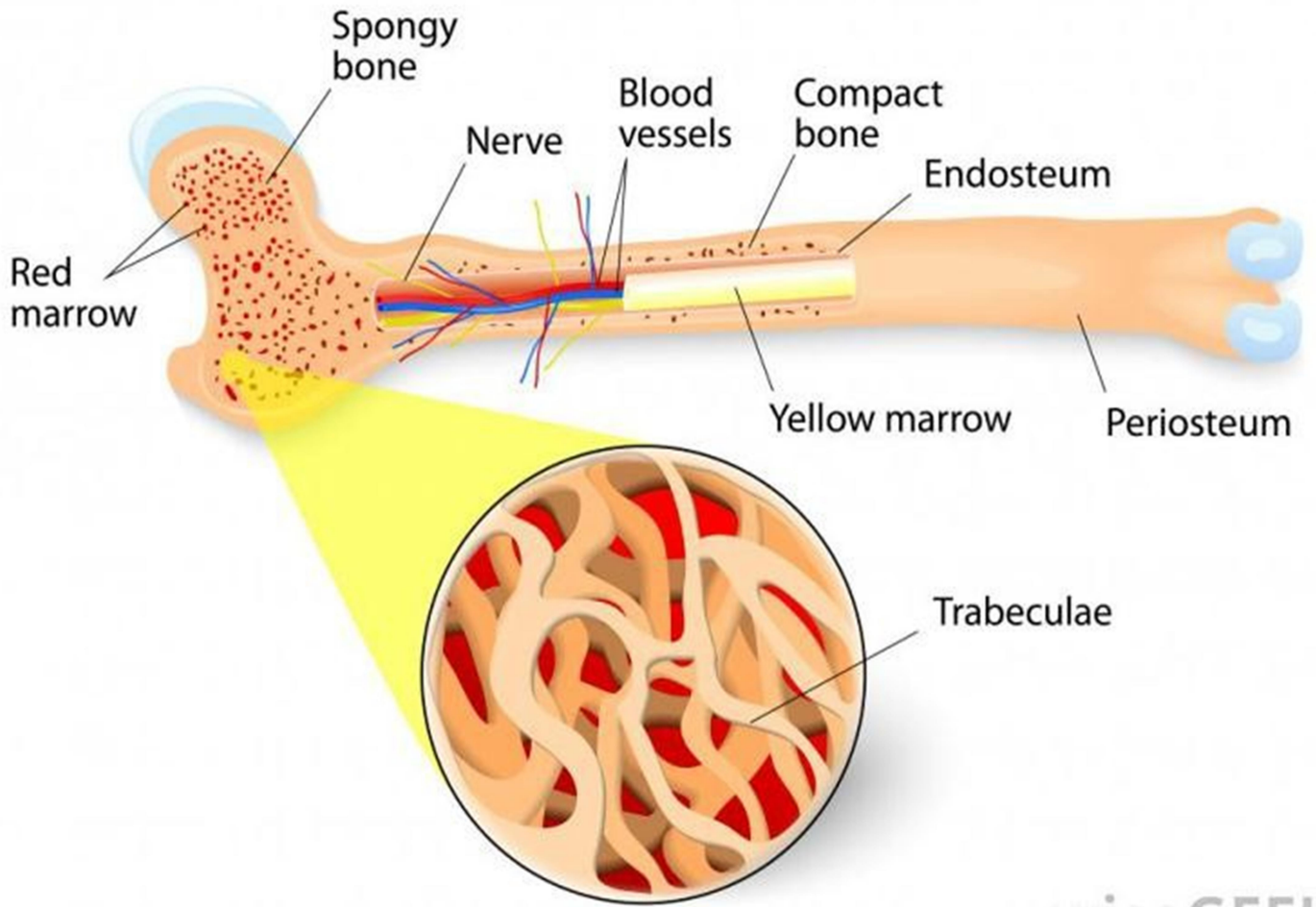


Figure 1: Bone anatomy.

Bone cells:

1- Osteoblasts:

Are responsible for the synthesis of the organic components of bone matrix (collagen and glycoproteins). They are exclusively located at the surface of bone tissue in a way resembling simple epithelium. When they are intensely engaged in matrix synthesis, osteoblasts have a cuboid shape and a basophilic cytoplasm. When their synthesizing activity declines, they flatten and cytoplasmic basophilia decreases.

2- Osteocytes:

Are mature cells found encapsulated in laminas of the mineralized bone matrix. Osteocytes are often somewhat shrunken in preparation, but their normal configuration can be inferred from the shape of the lacunae which they occupy. A lacuna is irregularly oval on the flat and biconvex on edge.

3- Osteoclasts:

Are multinucleated giant cells which vary greatly in size and in the number of nuclei they possess. They are found in close association with the surface of bone. Found in shallow cavities (Howship's lacunae). Osteoclasts usually have acidophilic cytoplasm. Recent evidence indicates that osteoclasts are derived from the fusion of blood-derived monocytes. These cells are probable involved in the resorption of bone , although the precise mechanism of this activity remains unclear. They do secrete collagenase and other proteolytic enzymes that attack the bone matrix and liberate the calcified ground substance.

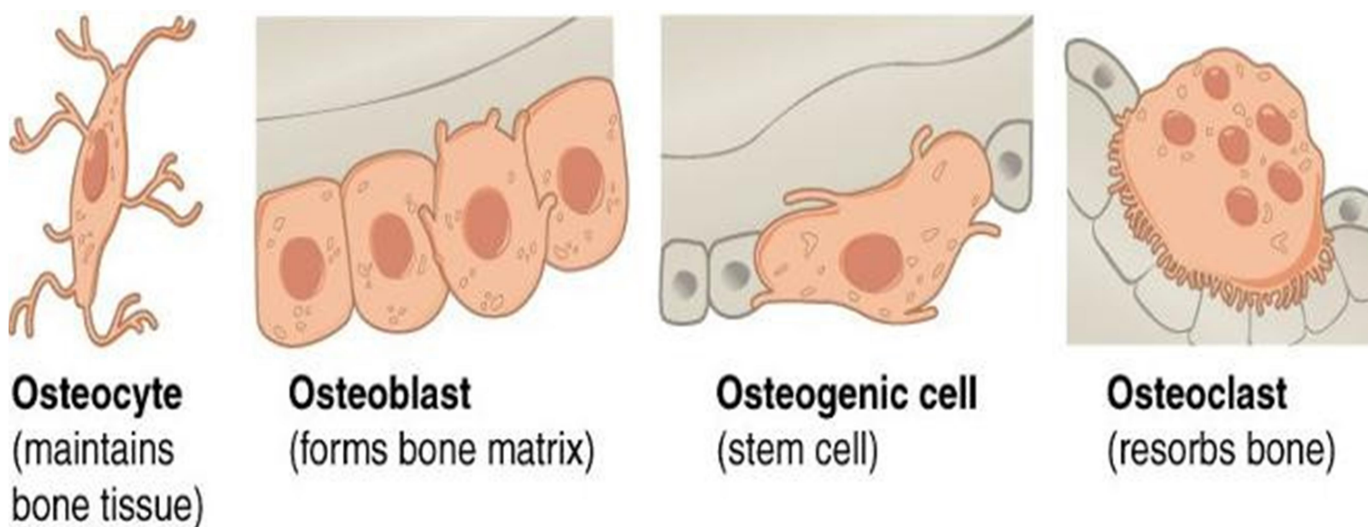


Figure 2: Bone cells.

- **Bone matrix:**

The organic portion comprising about **35%** is **chiefly osteocollagenous fibers**

similar to that of loose c.t. The fibers are difficult to see in ordinary preparations. They are united by a special cementing substance. **The bone matrix generally is acidophil unlike cartilage matrix which is basophil.**

The inorganic component is located solely in the cement between **fibers and accounts for 65% of the weight of a bone.** The minerals are present principally as **crystal of calcium phosphate.**