

The Skeletal System



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Function:

support, protection, movement, blood cell formation, mineral storage, storage of energy.

Types of Bones-

- Classified by shape: Long, flat, short, irregular.
- Sesamoid bones are embedded in tendons (patella, and some bones in the wrist).



Features of Bones: Epiphysis-The ends of long bones.

Diaphysis-The shaft of long bones.

Metaphysis-The region where the shaft joins the ends of the bones.



Proximal · epiphysis

Spongy (cancellous) bone (contains red bone marrow)

Metaphysis

 Medullary (marrow) cavity in diaphysis (contains yellow bone marrow in adult)

Compact (dense) bone

Epiphyseal Plate-The growth plate. A segment of cartilage that produces bone.

Epiphyseal line-

The feature produced when growth stops and the plate ossifies (becomes bone).

Articular Cartilage-

- The cartilage that covers the ends of bones where they join with other bones. Reduces friction, absorbs shock. Medullary cavity-
- The hollow portion of the diaphysis. Contains yellow bone marrow (fat). Periosteum-
- The connective tissue covering the outer surface of bone.

Tissues of the Skeletal System

The skeletal system is composed of the following connective tissues: bone, cartilage, and dense connective tissues (tendons, and ligaments)

- Matrix- the extra-cellular material surrounding the cells of connective tissue.
- Tendons and ligaments have a matrix with a large amount of collagen (tough strand-like protein).

Cartilage contains collagen but also has proteoglycans (polysaccharide and protein molecules that attract water molecules). It supports and cushions. Osteocytes are mature bone cells. Osteoblasts are cells that form bone. Osteoclasts are cells that function in resorption of bone matrix producing bone maintenance and repair.





Osteogenic cell (develops into an osteoblast) Osteoblast (forms bone tissue) Osteocyte (maintains bone tissue)

Osteoclast (functions in resorption, the destruction of bone matrix)

Bone has a matrix with small amounts of collagen and larger amounts of minerals like calcium and phosphates.

Compact Bone Tissue-The hard solid bone found along the diaphysis of long bones, and the very outer surface of other bones. Compact bone consists of circular layers of osteocytes and matrix called lamellae which surround a central canal that contains blood vessels and nerves.



Lacunae are spaces surrounding osteocytes. **Canaliculi** are microscopic canals projecting from the lacuna. A Haversian system or osteon consists of a central canal, lamellae, osteocytes, and

lacunae.



Cancellous (spongy) Bone Tissue-

The porous bone found in the epiphysis of long bones and the center of other bones. Hollow spaces are filled with red marrow (produces blood cells). Spongy bone has no haversian canals. Small delicate particles of bone called trabeculae are surrounded by spaces filled with red bone marrow. The trabeculae contain osteocytes.

Ossification-(Bone formation)

Osteoclasts are bone cells that breakdown bone.Osteoblasts are bone forming cells. The combined action of these two types of cells can cause bone to change shape as it grows.

Intramembranous Ossification-Bone formation in membranes. The soft spots (fontanels) of the skull.



Blood capillary

- Center of ossification
 Mesenchymal cell
 Osteoblast
 Collagen fiber
- Development of center of ossification



- Osteocyte in lacuna
- Canaliculus
- Osteoblast Newly calcified bone matrix

Osteocytes deposit mineral salts (calcification)



3 Formation of trabeculae



Periosteum: - Fibrous layer - Osteogenic layer

- Spongy bone tissue Compact bone tissue
- Development of periosteum, spongy bone, and compact bone tissue

Endochondral Ossification-Bone formation in cartilage. The epiphyseal plates of long bones. The continual replacement of bone tissue throughout the life of an individual is called remodeling.





Radiograph of a portion of the tibia and fibula

The diameter of bones can change by the destruction of bone inside and the construction of bone on the outside. Even after growth is complete, bone can be destroyed and replaced. Osteoblasts and osteoclasts are responsible for these changes.

When bone is placed under stress(like excercise) it can respond by depositing more calcium and increasing the production of collagen fibers thus making it stronger. With age, bone decreases it's density.

In women this begins around the age of 30. In men about 60. Collagen fibers (organic portion of bone matrix) also decrease causing bones to become more brittle.

Features of Bones

Foramen-Hole in bone. Canal or meatus-A tunnel like passage running through bone **Fossa-** Depression Tuberosity-a rounded lump, or roughened process

Process- Projection of bone

- Condyle- a large rounded prominence
- Crest- A prominent ridge
- Sinus- A cavity in bone
- head-a rounded articular projection supported by a constricted portion called the neck

trochanter-large projections found on femur

tubercle-projections found near the head of the humerus

The Skeleton

- Axial-
- The skull, vertebral column, thoracic cage.
- Appendicular-The arms and shoulder girdle, the legs and pelvic girdle.















