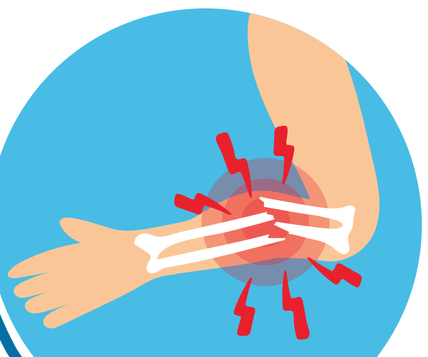
Skeletal System
Functions of the Skeletal System

- This system makes up the bone framework that supports the body by maintaining structure.

  Bones also:

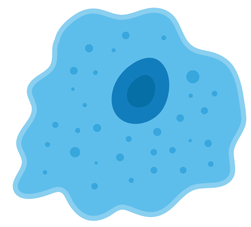
  - Protect the organs
  - Allow movement by supplying the ligaments and tendons with something to latch onto
  - Hold minerals (mainly calcium) and fat
- Within the bones is the bone marrow, where red and white blood cells are produced.
- Bones are made out of collagen, calcium, and bone cells. The collagen keeps the bones from getting brittle and breaking, which makes them slightly flexible. Calcium phosphate is a mineral that makes the bones strong and dependable.
- After a break, the muscle and skin around the bone have an inflammatory reaction.
  - There are cytokines and prostaglandins that are released.
  - The bone will begin to heal when the clotted blood is replaced with fibrous tissue, which forms a soft callus.
  - Over time, the callus becomes hard and, if the body's healing mechanisms are sufficient, regular bone tissue may replace the callus.
    - In some instances, the bone never fully heals, leaving the hard callus in place, which may cause discomfort or secondary issues.
      - This can cause a bump on either side of the bone. It is an easy way to tell whether or not the bone has been broken before.

As a child grows, the bones merge and become stronger. he number of bones goes from 300 to 206 by adulthood.



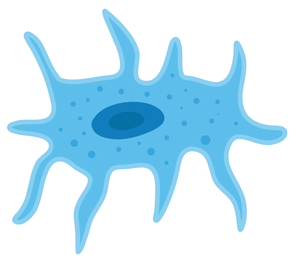
Different Types of Bone Cells:

- Osteoblast – this cell is found on the surface of the bone (on/in compact tissue) and it forms new tissue. This regenerates the bones after being broken or damaged.
- Osteoclast – this cell is found in the bone and breaks down bone tissue to release it into the bloodstream. This is often when the calcium levels in the blood are low.
- Osteocyte – these are the cells that make up the bone.



Osteoblast

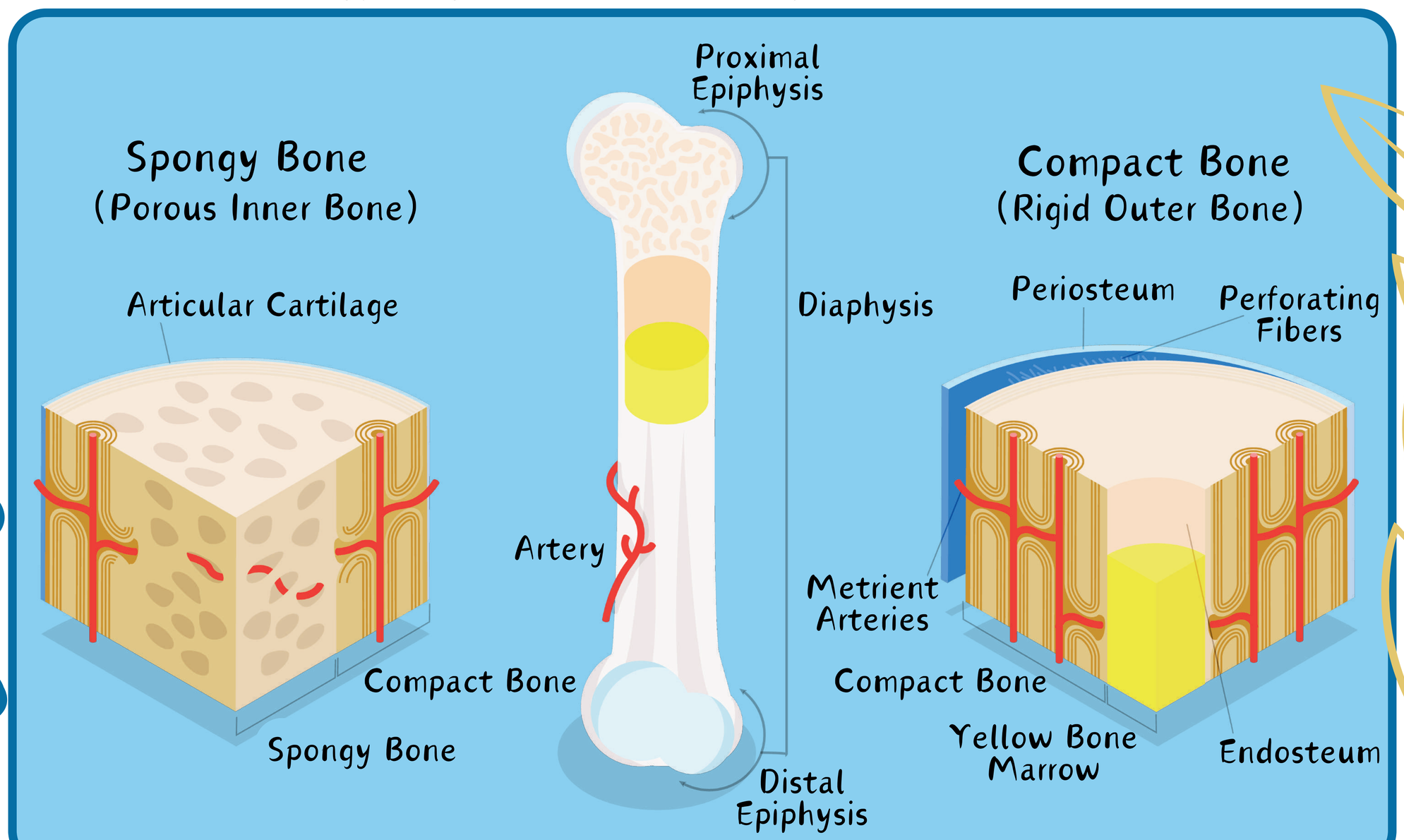
Osteoclast



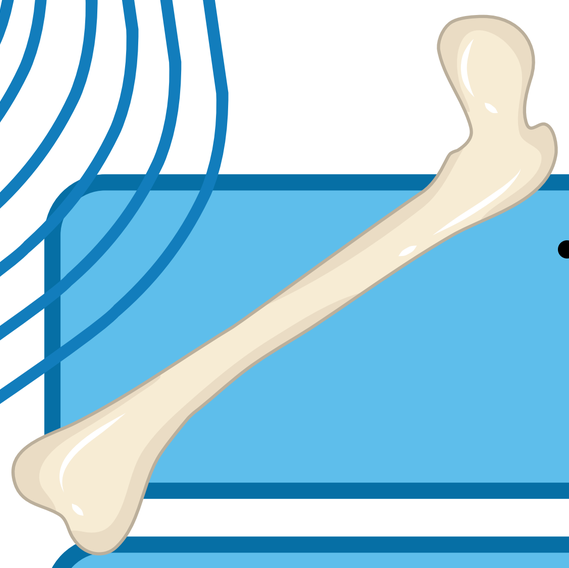
Osteocyte

Bones are made up of two different sections:

- Compact bone covers the outside of the bone and keeps the structure sturdy and dependable.
  - It is a very dense layer that is much harder than the inside of the bone.
  - This part provides support and strength and can withstand a large amount of stress.
  - This part of the bone is made of closely packed osteons (unit of bone).
  - Lamellae are layers of the compact bone that surround a tunnel in the middle of the bone.
- The middle section of bones is made of spongy tissue (also known as spongy bone).
  - This tissue has large pores throughout the structure that allow bone marrow to exist and be supported by the bone.
  - This tissue is made from assembled pieces of bone called trabeculae. Trabeculae is typically found in large bones. These bone structures are connected and assembled to provide maximum strength.
  - This tissue receives blood through canaliculi and needs nutrients because it does not contain osteons.
  - This tissue isn't found everywhere. It is only found in larger bones because there is no space for it in some of the smaller, more delicate bones.
    - It is mainly found in the pelvis, ribs, CNS bones, and long bones.
      - This is typically the ends of the larger bones.

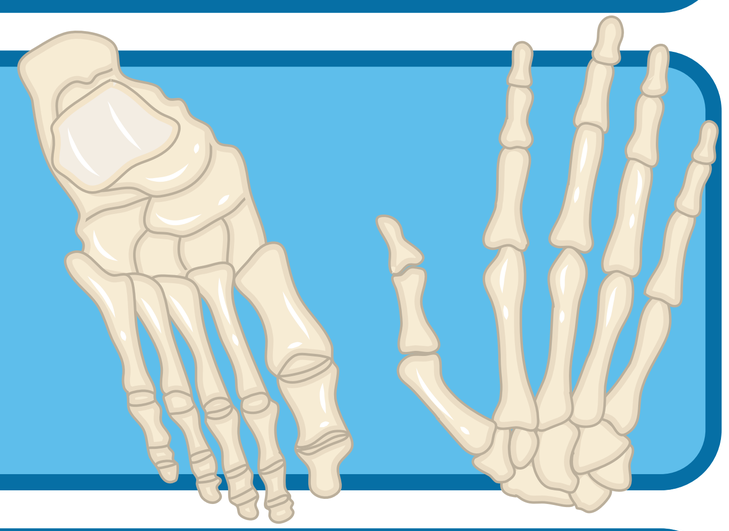


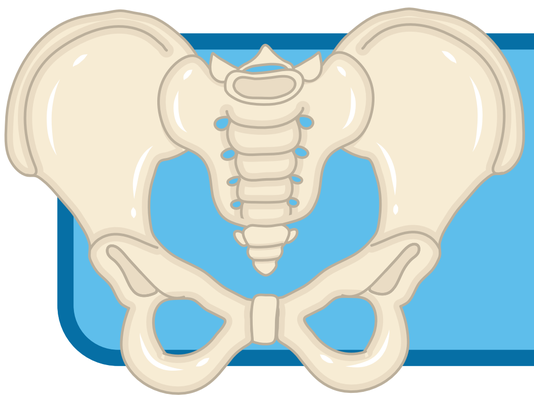
Types of Bones



- Long bones – these bones have a long shaft (also known as the diaphysis). They aren't as wide as they are long. One example of a long bone is the femur.

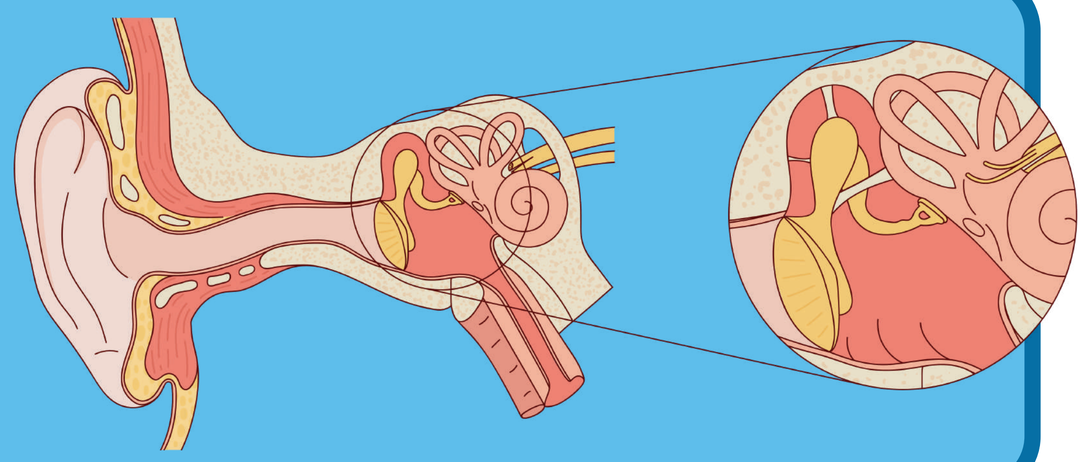
- Short bones – these are not very long. Their width and length are generally the same. These have the most spongy tissue. Some examples are carpals and tarsals.





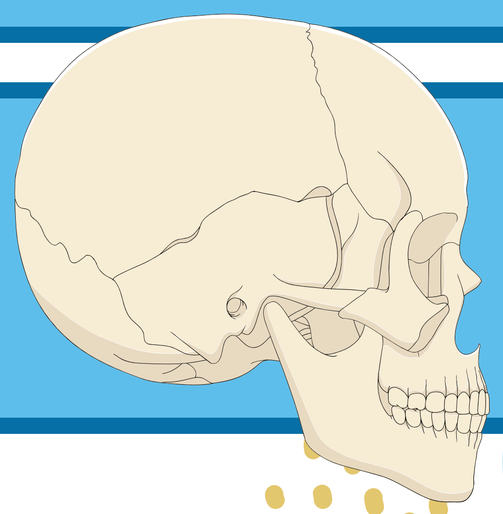
- Flat bones – these are wide bones that aren't very thick. These are made of compact bone with a very thin layer of spongy bone. One example of this is the pelvis.

- Irregular bones – these bones are very niche and fit very specifically. Some examples are the three ear bones: the malleus, incus, and stapes. They are uniquely shaped and small.



- Sesamoid bones – these are small bones that are attached to or embedded in tendons.

- Sutural bones – these bones are small and flat and work to connect the bones of the skull.



Parts of the Bone

- The spongy bone tissue is designed to hold and support bone marrow. Bone marrow makes red and while blood cells. It also makes platelets. There are stem cells that exist in the bone marrow and develop into whatever the body needs. For instance, if there is an infection in the body, the stem cells will turn into white blood cells.
    - The process of producing blood cells is called hematopoiesis. This is when immature stem cells develop into what the body needs.
- The diaphysis is the middle part of long bones. This is often called the shaft, and it is made up of compact bone. It needs to be strong and dependable because the diaphysis takes a lot of strain.
- The medullary cavity is the middle part of the bone that contains the red and yellow bone marrow. This is where the spongy bone is.
- Periosteum is the light membrane that covers the compact tissue of the bones.
- Endosteum lines the inner surface of the medullary cavity. This membrane is thin and vascularized.
- Condyles are the round part at the ends of the bones. These often connect to make joints with cartilage. There is often another layer to condyles. There are projections that come off the condyles that are called epicondyles.
- The foramen are small openings in the diaphysis of the bone that allow nutrients to pass. Bones need nutrients to stay strong.
- The meatus of a bone allows nerves and blood vessels to enter the bones.