



## Compact and spongy bone

Although bones may appear uniform, they are actually composed of two different types of bone tissue: compact bone and spongy bone.

Surrounding every bone is a layer of hard bone, or compact bone. Running the length of compact bone are tubular structures known as osteon systems, shown above. Compact bone is made up of repeating units of osteon systems. Living bone cells, or osteocytes, receive oxygen and nutrients from small blood vessels running within the osteon systems. Nerves in the canals conduct impulses to and from each bone cell. Compact bone surrounds less dense bone known as spongy bone because, like a sponge, it contains many holes and spaces.

## Formation of a bone

The skeleton of a vertebrate embryo is made of cartilage. By the ninth week of human development, bone begins to replace cartilage. Blood vessels penetrate the membrane covering the cartilage and stimulate its cells to become potential bone cells called osteoblasts. These potential bone cells secrete a protein called collagen in which minerals in the bloodstream begin to be deposited. The deposition of calcium salts and other ions hardens and the newly formed bone cells, now called osteocytes, are trapped. The adult skeleton is almost all bone, with cartilage found only in places where flexibility is needed—regions such as the nose tip, external ears, discs between vertebrae, and movable joint linings.

## Skeleton System Functions

The primary function of your skeleton is to provide a framework for the tissues of your body. The skeleton also protects your internal organs, including your heart, lungs, and brain. The arrangement of the human skeleton allows for efficient body movement. Muscles that move the body need firm points of attachment to pull against so they can work effectively. The skeleton provides these attachment points. Bones also produce blood cells. Red marrow—found in the humerus, femur, sternum, ribs, vertebrae, and pelvis—is the production site for red blood cells, white blood cells, and cell fragments involved in blood clotting. Yellow marrow, found in many other bones, consists of stored fat.

1. Sketch the osteocyte (bone cell) seen with the microscope.
2. What are osteon systems? Why are they important to bone structure and function?
3. What is an osteoblast? Be descriptive.
4. Where is bone marrow found?
5. What types of cells are produced by red bone marrow? What does yellow marrow contain?

