The Relationship Between The Functions Of The Skeleton And Its Structure

The skeletal system has six main functions that are vital for supporting the body and its functionality: Support, movement, protection of internal organs, production of red blood cells, mineral storage and endocrine regulation. The skeletal system is typically made up of 206 bones that create a framework which our muscles and organs can connect to.

The Axial skeleton is made up of 80 bones that support the central structure which includes the skull, ribcage and spine and protects the brain, spinal cord, heart and lungs. The remaining 126 bones make up the Appendicular skeleton which protects major organs associated with digestion and reproduction. The skeleton facilitates movement of the body and is responsible for providing stability when walking or running and allowing a greater range of motion when lifting, working alongside the muscular system.

Metabolically, bone tissue is critically important. All bone is made up of compact bone, spongy bone and bone marrow. The bone matrix stores minerals such as calcium and phosphorous, which are released back into the bloodstream when needed, maintaining the correct levels to support our body's physiological processes, such as growth and repair of cells and tissues, muscle movement and enzyme release.

Bone, and more specifically, bone marrow which is the soft tissue that fills the bone cavities, is used for red blood cell production and fat storage. Triglycerides, or fatty acids are stored in the yellow bone marrow which the body will use as a source of energy. The yellow bone marrow can be converted to red marrow if the body requires, such as severe blood loss or fever, when the need for new blood formation is high. Red bone marrow is where hematopoiesis takes place, producing red and white blood cells and platelets, which will be transported when mature into the bloodstream to perform their vital bodily functions. Red blood cells will transport Oxygen around the body, white blood cells will be used to fight infection and disease and platelets are used to help the clotting process and prevent bleeding. Red blood cells, along with the liver and spleen are also capable of the destruction and removal of old red blood cells.

Bone itself is capable of producing at least two protein hormones; Fibroblast growth factor 23 and Osteocalcin. FG23 is a protein that is necessary to regulate phosphate levels within the body, and signals the kidneys to stop reabsorbing phosphate into the bloodstream. One of the functions of the kidneys is to excrete excess phosphate and reabsorb the mineral into the bloodstream when it is needed again. Osteocalcin, is a calcium binding protein hormone which has many functions. It is secreted to increase insulin production in the pancreas, and triggers the release of adiponectin, which increases sensitivity to insulin in fat cells. In muscle, Osteocalcin is used to provide energy during exercise by regulating Glucose metabolism; and in the testes, osteocalcin affects male fertility by stimulating testosterone. Finally, Osteocalcin plays a vital role in the development and functioning of the brain and is released when an acute stress response is activated.