Human Bones

Functions of bone

Bones are responsible for ensuring structural support within the body and give protection for vital organs (Amini et al. 2012). In addition to this bone provide an environment for marrow, which is where blood cells are produced, and act as a storage location for minerals (Amini et al. 2012).

Structure and composition of bone

The loading situations acting on the skeleton influence the growth of the most macroscopically diverse bone structures *in vivo*, creating carefully tailored shapes, mechanical properties and spatial distributions (Stevens 2008). There are 206 different bones that make up the human skeletal structure (Stevens 2008). These include long bones that are found in the limbs, short bones in the wrist and ankles, flat bones in the sternum and skull and irregular bones in the vertebra (Stevens 2008). An average bone is usually enveloped in a dense layer of vascular connective tissue known as periosteum; joints are exempt (Donald 2014). This is followed by a dense and tough outer layer, of cortical (compact) bone, and beneath this is a spongy layer called trabecular (Cancellous) bone which is lighter, slightly flexible with enclosed spaces containing blood and marrow (Donald 2014). The bone is further built up of collagen and non-collagenous proteins, inorganic mineral salts and bone forming and reabsorbing cells (Amini et al. 2012). The bone forming cells are called osteoblasts and osteocytes and the bone reabsorbing cells are named osteoclasts (Amini et al. 2012). In mature bones, trabeculae are organized in orderly patterns that allow for continuous units of bone tissue aligned parallel with lines of compressive and tensile forces (Donald 2014). Hence trabeculae create a series of complex cross-branched interior struts arranged so that maximal rigidity is gained with as minimal material as needed (Donald 2014).

Bone regeneration process

It is also important to understand bone regeneration process. This will happen in two stages; the initial stage is known as formation of woven bone where collagen formed randomly with weak mechanical strength. During the second stage, collagen aligns as sheets (lamellae), which provides appropriate mechanical strength known as lamellar bone. Almost all bones in a healthy adult are lamellar bone in nature (Amini et al. 2012).

Bone healing

Bone repair restores damaged tissue to its previous physical and mechanical state. Bone healing occurs in three distinct but overlapping stages: (1) early inflammatory stage; (2) repair stage and (3) remodeling stage (Kalfas 2001). During the early inflammatory stage a hematoma develops within the fracture site. Inflammatory cells and fibroblasts enter the fracture site and initiate the formation of granulation tissue, ingrowth of