

## Supplementary Session Document Revision Notes: Development and Growth of Bone

- ▶ The limbs develop from a mass of cartilage -
- ▶ long bones grow in length from a growth plate (epiphyseal cartilage).
- ▶ This is a layer of cartilage situated between the shaft (diaphysis) and the extremity (epiphysis).
- ▶ The distal phalanx and the sesamoids originate from a spheroidal growth plate which has ossified before birth.
- ▶ The osteoblast within the periosteum produces new bone as if from a central point.
- ▶ The Longitudinal growth of bone only continues as long as the growth plate exists, at first the plate is wide and its limited growth after birth is rapid, but later the plate narrows as the rate of growth is reduced.
- ▶ Finally the plate is replaced by bone and the diaphysis and the epiphysis fuse.
- ▶ The Diameter of bone is increased by osteogenic cells; Osteoblasts, which form part of the inner cellular layer of periosteum, lay down new bone.
- ▶ The outer fibrous layer of periosteum covers the entire surface of the bone except where there is articular cartilage.
- ▶ Osteoblasts (largely in the endosteum) re-absorb bone where it is no longer required, e.g. in the medullary cavity
- ▶ The Composition of bone
  - Dry fat free adult bone consists of 45% Organic (animal) matter, chiefly of the protein bone - collagen.
  - This gives the bone toughness and elasticity.
- ▶ The other element consisting of 55% Inorganic (material) matter gives the bone its hardness, due to the deposition of mineral salts mainly-
  - calcium 29%
  - phosphorous 13%
  - magnesium, sodium
  - and other trace elements.

### **Structure and Strength of bone**

- ▶ The tubular shafts are formed by cortical (compact) bone, the thickness reflecting where the load or stress is greatest.
- ▶ The centre of short bones and the extremities of long bones when viewed through a Sagittal section reveal cancellous bone, which has a more open framework, is irregular in shape, and instead of possessing a cavity, its centre is divided into innumerable tiny spaces by a fine network of bony threads, which support the important red marrow.
- ▶ Cancellous bone assists in the absorption of concussion and is often referred to as soft or spongy bone.

### **Repair of bone**

- ▶ A bone needs good blood circulation to repair itself, the periosteum plays an important role in the repair of bone.

### **Epiphyseal Cartilages**

What are Epiphyseal Cartilages?

- ▶ Increase in bone length occurs from the growth plate, a layer of cartilage between the diaphysis (shaft) and the epiphysis (extremities).

What do they do?

- ▶ The skeleton of the foetus (unborn foal) is developed entirely from cartilage most of which has ossified at birth, although certain areas of cartilage remain.
- ▶ Linear growth continues only as long as the growth plate exists. While these growth plates exist they are of primary importance in the alignment of the limb during the early development stages.
- ▶ Growth plates ossify from their centre outwards.

Where are they found?

- a) Distal extremity of the third metacarpal. (Closure between 6 - 12 months)
- b) Proximal extremity of the proximal phalanx (Closure between 4 - 9 months)

- c) Proximal extremity of the middle phalanx (Closure between 3 - 6 months)
  
- ▶ The distal phalanx does not have a growth plate, but does have a cartilaginous cap which ossifies before birth.