

OSSIFICATION

rvsd 18 Oct 04, 15 Oct 08, 14Oct09, 18Oct10, 17Oct11
 Martini's 5th: 21 Oct 02, Martinbi's 6th: 191-194, 8th: 194-205

Development of Bone:

Three types of bone cells associated with bone formation and maintenance:

- | | |
|-------------|-------------------------------|
| osteoblasts | early bone forming cells |
| osteocytes | bone maintenance |
| osteoclasts | remodel bone, release calcium |

Three types of ossification:

- | | |
|---------------------------------|-------------------|
| embryonic: Intramembranous | initial formation |
| Primary endochondrial | initial formation |
| growth: Secondary endochondrial | elongation: |



Intramembranous Ossification page 191

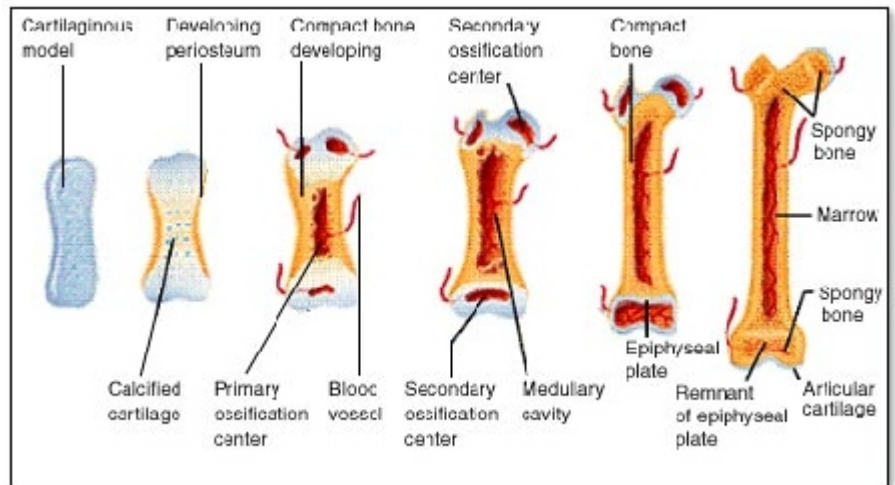
(also dermal bone b/c formed in deep dermis, as in the skull, etc.)

- 1) **fibroblasts** lay down **collagen**, forming a membrane
- 2) **osteoblasts** form **spongy bone** network inside the membrane (with blood supply)
- 3) **periosteal membrane** forms around, osteoblasts appear, form compact bone = diople

Endochondral Ossification: (of hyaline cartilage)

Primary:

- 1) cartilage model formed
- 2) **perichondrium** converted to **periosteum**
- 3) **osteoblasts** gather inside form collar of compact bone
- 4) internal cartilage reduced to thin partitions
- 5) **matrix begins to ossify**
- 6) **chondroblasts starve, die**
- 7) **osteoclasts** hollow out medullary cavity



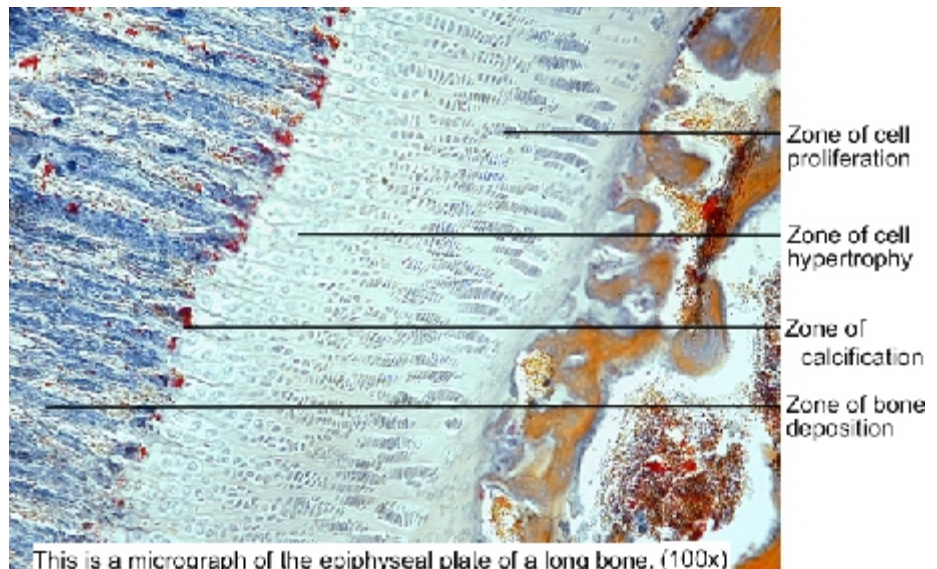
Secondary:

- 1) **chondroblasts** enlarge epiphyseal cartilage
- 2) cartilage towards diaphysis ossifies
- 3) as ossification occurs below, new cartilage forms above
- 4) **osteoclasts** remodel below
- 5) epiphyseal cartilage replaced by **epiphyseal line** by age 25,

Exercise affects bone physiology:

Bone grows in response to stress, without, salts withdrawn (astronauts can have severe bone loss)

Responds to compressional, functional and electrical forces



Bone formation:

phosphate released by alkaline phosphatase combines with Ca under influence of calciferol to form colloidal precipitates. This is converted into hydroxyapatite: $3Ca_3(PO_4)_2 \cdot Ca(OH)_2$ stressed bone forms neg charge, may stimulate alkaline phosphatase.