Hormones

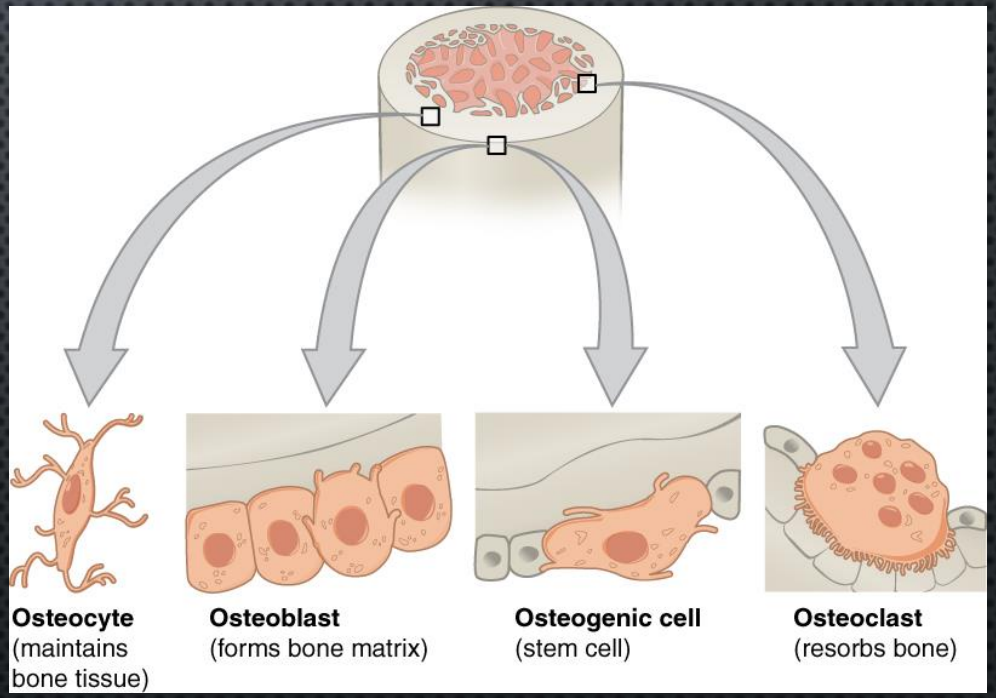
- Growth hormone secreted from the anterior pituitary increases general tissue growth, specifically appositional bone growth and interstitial cartilage growth
- Thyroid hormones:
  - Calcitonin & thyroxine
- Calcitonin
  - Promotes calcium loss in the kidneys & reduces blood levels
  - Inhibits osteoclast activity
- Thyroxine
  - Stimulates osteoblast activity & bone matrix synthesis
- Sex Horhomes
  - Estrogen & testosterone stimulates osteoblast activity

BONE FORMATION, GROWTH, & REMODELING

- Most bones develop using hyaline cartilage structures as their "models"
- In embryos, the skeleton is primarily made of hyaline cartilage
- In childhood, most of the cartilage has been replaced by bone
- Cartilage remains only in the bridge of the nose, parts of the ribs, and surfaces of the joints
- Flat bones form on fibrous memebranes

BONE CELL TYPES

- Osteocytes
  - Most common
  - Each occupies a lacuna
  - 2 primary functions:
    1. Maintain and monitor protein & mineral content of bone matrix
    2. Participate in bone repair
- Osteoblasts
  - Bone producing cells
- Osteoclasts
  - Cells that break down bone
- Osteoprogenitor Cells
  - Stem cells that differentiate into osteoblasts



Bone Ossification

- Ossification
  - The formation of bone by osteoblasts & synthesis of extracellular matrix and addition of minerals to matrix
  - Process of replacing other tissues with bone
- Calcification
  - Deposition of calcium salts during ossification

2 Processes of Bone Ossification

- Intramembranous Ossification (Dermal Ossification)
  - Bone that develops from fibrous connective tissue
  - Occurs in deep layers of dermins (dermal bones) – skull (fontanels), mandible, clavicle
  - 3 Steps
    1. Mesenchymal cells (stem cells that are present in many CT) aggregate & being the ossification process; bone expands out from the ossification centers as a series of spicules (small struts); mesenchymal cells differentiate & produce osteoblasts
    2. Bone growth is active & requires oxygen & food; blood vessels form & become trapped in the growing bone
    3. Over time, intramembranous is only spongy bone; as the bone matures spongy bone is removed for marrow cavities; spongy bone formed in this process can become compact

2 Processes of Bone Ossification

- Endochondral Ossification
  - Responsible for the increase in length of bones
  - In long bones, endochrondral growth at the epiphyseal plate results in the increase of the diaphysis
  - Most bone starts as hyaline cartilage
    - Cartilage is a miniature model of what the bone will look like in adulthood
    - Models become bone in endochondral ossification