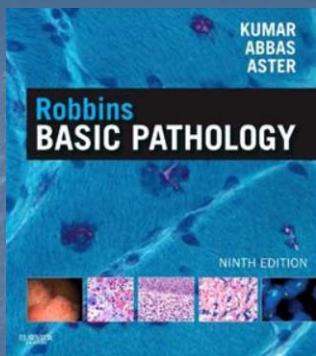


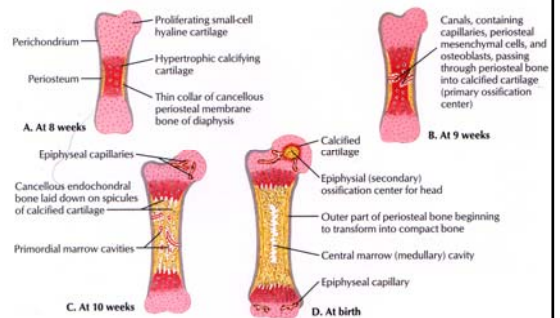


## Musculoskeletal Disease

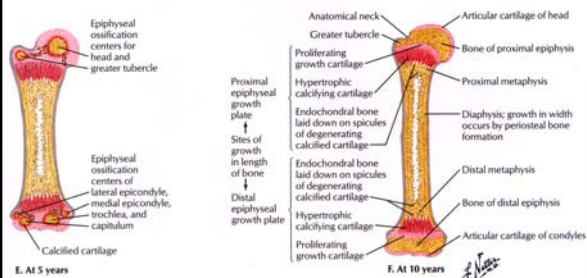


## Long Bone Formation

Growth and ossification of long bones (humerus, midfrontal sections)

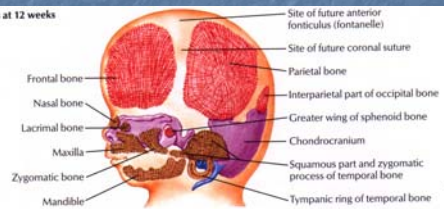


## Long Bone Formation

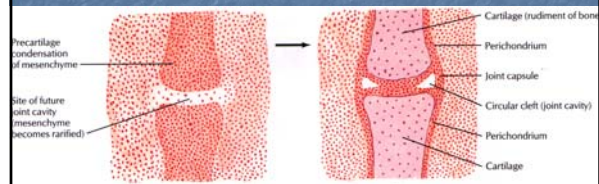


## Membranous Bone

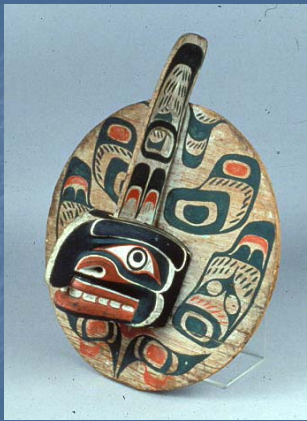
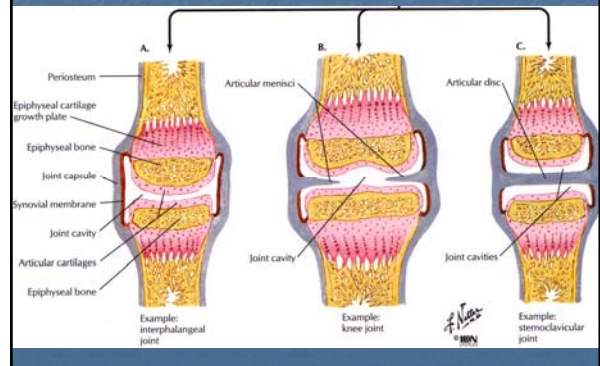
Membrane bones at 12 weeks



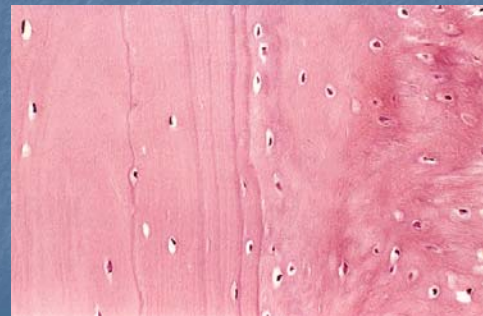
## Articular Joint Formation



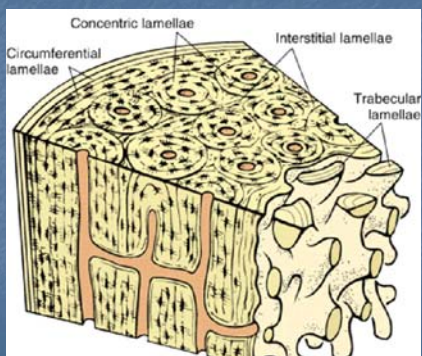
## Articular Joint Formation



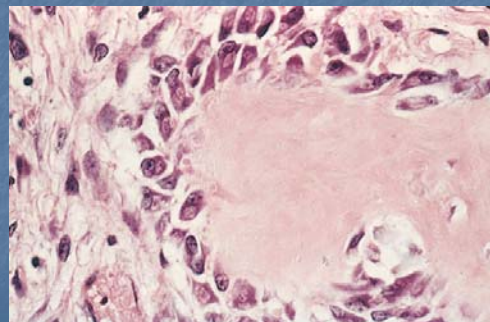
## Woven vs. Lamellar bone



## Lamellar Bone

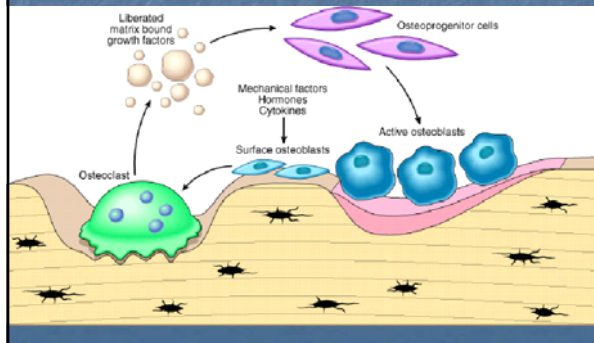


## Bone Structure





## Bone Metabolism



## Osteogenesis Imperfecta

- Brittle Bones Dis.
- Multiple Subtypes
  - Auto Dominant
  - Auto Recessive
- Collagen defect
  - Bad bone matrix
- Blue sclera



## Osteogenesis Imperfecta

- [Dane folk](#)



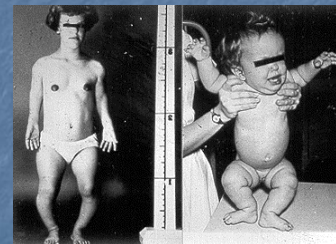
## Osteopetrosis

- Rock-like bones
- Actually 'Chalk'
- Osteoclast defect
- Can't resorb
- Many Frxs



## Achondroplasia

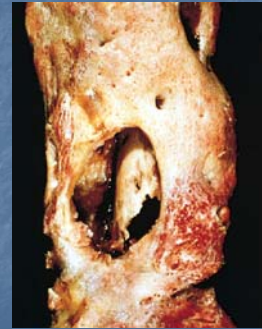
- Premature closure of epiphyses
- Auto dominant
- Homozygous is lethal





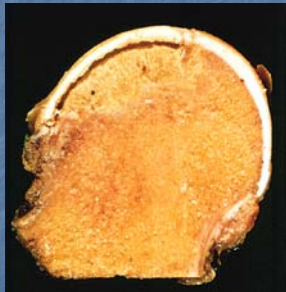
## Osteomyelitis

- Direct infection of bone.
- Bacterial most often
  - Staphylococcus
  - Salmonella
    - Sickle Cell Disease
  - Tuberculosis
    - Spine first
- Syphilis
  - Periosteum



## Avascular Necrosis

- Weight bearing jts.
- Developmental?
- Physically active.
- Compression and necrosis of bone and articular cartilage.

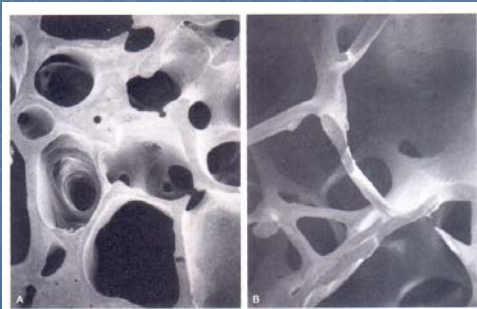


## Osteoporosis

- Loss of bone mass
- Calcium metabolism is secondary
- Peak bone mass
- Women
- Fractures
- HRT



## Osteoporosis



## Osteoporosis

- Collapse of vertebral bodies
- Kyphosis
- Loss of height
- Hip fractures
- Peak bone mass
- Physical activity
- Genetics



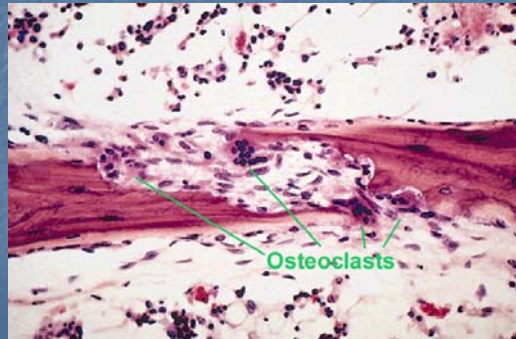


## Vitamin D Deficiency

- Rickets
  - Developing bone
  - Can't convert cartilage model to bone
  - Permanent deformity
- Osteomalacia
  - Adults
  - Can't remodel
  - Softening of bone



## Hyperparathyroidism



## Paget's Disease

- Viral infection
- Destructive and proliferative
- Sclerosis of marrow space
- Skull and pelvis
- Increased incidence of primary bone tumor



## Clubbing

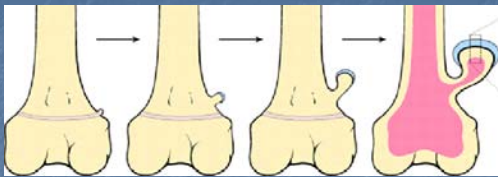
- Hypertrophic osteoarthropathy
- Soft tissue and periosteal bone
- Emphysema
- Lung cancer
- Heart defects



## Bone Tumors

- Benign vs. Malignant
- Primary vs. Metastatic
- Symptoms
  - Pain
  - Enlargement
  - Fracture at site of tumor

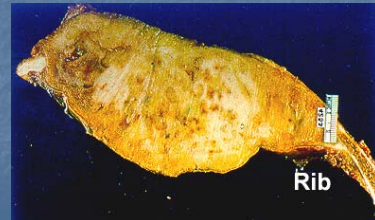
## Osteochondroma



- Unopposed cartilage growth
  - Mechanical injury to growth line?
- Continues to grow as a unit for years.
- Problem of diagnosis.

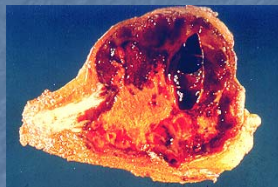
## Fibrous Dysplasia

- Developmental remnant?
- Benign although term dysplasia can be confusing
- Genetic defect in some
- Weakened area of bone
- Jaw, ribs and long bones



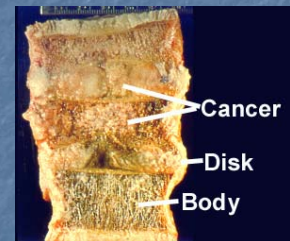
## Bone Cysts

- Fairly common
- Benign
- Ribs
- Weakened area tends to fracture



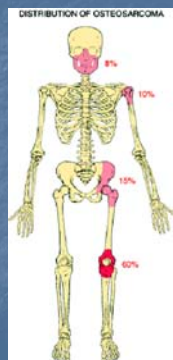
## Malignant tumors, metastatic

- From practically any cancer
  - Breast
  - Prostate
  - Lung
- To any bone
  - Vertebrae
  - Long bones

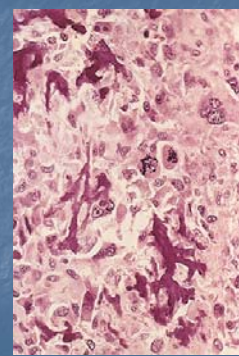
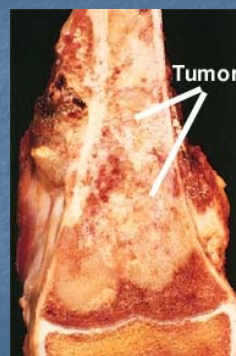


## Osteosarcoma, Primary Malignancy

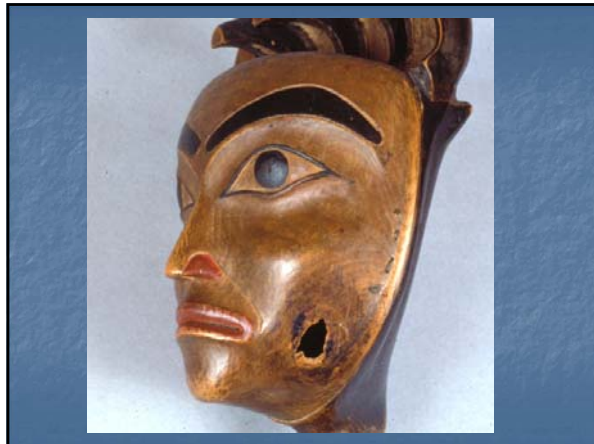
- Weight bearing
- Long bones
- Young people
- Osteoblast is malignant cell
- Genetics of tumor being unraveled



## Osteosarcoma, Primary Malignancy







## Arthritis

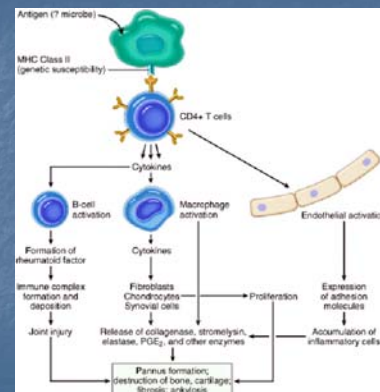
- Inflammation of the joints
  - Articular surface and/or joint capsule.
- Infectious
  - GC
  - Lyme & others
- Immune mediated, rheumatic fever
  - Streptococcal trigger
- Autoimmune, rheumatoid arthritis
- Wear and Tear, osteoarthritis
- Crystal arthritis, gout

## Rheumatoid Arthritis

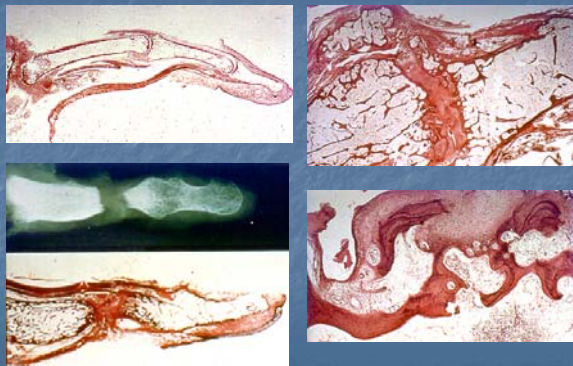
- Genetically susceptible
- Trigger
  - Virus? EB
- Autoimmune destruction
  - Rheumatoid factor
  - Citrullinated peptide antibodies
- Loss of articular cartilage
- Joint fusion



## Rheumatoid Arthritis



## Rheumatoid Arthritis



## Reiter Syndrome

- Arthritis
- Non-GC urethritis or cervicitis
  - Chlamydia
  - Shigella, Salmonella...
- Conjunctivitis
- Men in their 20's
- HLA-B27 (80% +)
- Autoimmune with infectious trigger
- Low back stiffness and pain.



## Reiter Syndrome

- HLA B27
- Young men
- Chlamydia
- Symptoms may regress, but
- 50% have recurring problems



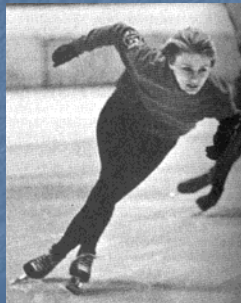
## Reiter Syndrome

- Sausage fingers
- Secondary to tendonitis
- Cardiac conduction problems



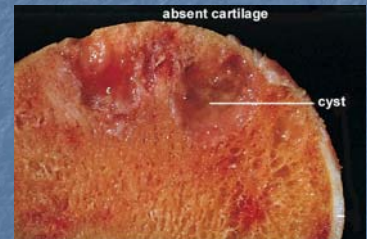
## Osteoarthritis

- Wear and tear on joint cartilage
- Normally there is very little friction.
- Minimal damage leads to cartilage fractures.
- Synovial fluid into underlying bone.
- Microcysts and bone necrosis.

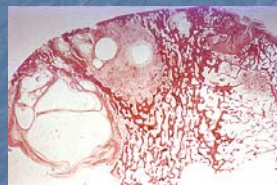


## Osteoarthritis

- Weight bearing joints
- Injury to cartilage
- Progressive
- Middle-age and older

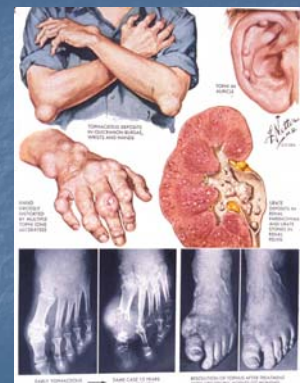


## Osteoarthritis



## Crystal Arthritis

- Gout
- Uric acid crystals
- Genetics and diet
- Crystals in joint space and soft tissues
  - Tophi in soft tissue
- Intense inflammatory reaction in joint
- Very Painful





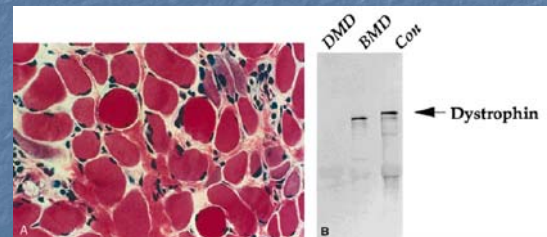
## Gout



## Myasthenia Gravis

- Autoimmune motor endplate disease
  - Antibodies against acteylcholine receptor
  - Decreased number of receptors
  - Progressive weakness
  - Thymic hyperplasia or tumor
  - Other autoimmune diseases in 15%

## Duchenne Muscular Dystrophy



## Duchenne Muscular Dystrophy

