**Lecture 4**  
Supportive Connective Tissues

- **Function**: Provide physical framework of the body

- **Characteristics**:  
  1. *Specialized cell* populations  
  2. Matrix consistency: *Semisolid to solid*  
     - Numerous protein fibers  
     - Modified ground substance  
  3. Matrix physical feature: *Compression resilient to resistant*  

Hyaline Cartilage
• Defined according to:
  1. Cell types: **Cartilage or Bone**
  2. Matrix protein fiber: **Type & density**
  3. Matrix composition: **Polysaccharides, proteins & minerals**

  **Cells**: Chondrocytes
  **Fibers**: Collagen & dense matrix
  **Matrix**: Chondroitin sulfate
  = Fibrocartilage

• 2 subdivisions: **Cartilage, Bone**
  1. **Cartilage** (chondros = “cartilage”)
     • **Characteristics**: Flexible & compression resilient
     • **Functions**:
       Support of soft tissues
       Cushioning / Shock absorption
       Scaffold for long bone development

• Diagrams and text related to cartilage and bone structures.
Cartilage Cells:

a. **Immature Cartilage cell:** Chondroblast
   “blast” = bud or precursor
   - Differentiate from: Mesenchymal cells
   - Function: Secrete Cartilage matrix

b. **Mature Cartilage cells:** Chondrocyte
   - Differentiate from: Chondroblast
   - Function: Maintain Cartilage matrix
   - Location: Lacuna(e): Lacus = "pool"
     - Space w/in matrix

Matrix:

a. **Collagen fibers:** Tensile strength
b. **Elastic fibers:** Flexibility & resilience
c. **Ground substance:** Compression resilience
   - Glycosaminoglycan composition:
     - Chondroitin Sulfate
     - Consistency: Firm gel
d. **Avascular**: (mostly) No direct blood supply

→ Nutrients acquired by **diffusion**

- **Perichondrium**: Vascular connective tissue sheath

  peri = “around”; Chondrium = “cartilage”

- **Function**: Support, protection, attachment, growth & maintenance
1. **Fibrous Layer**: Mechanical support, protection & attachment
2. **Cellular Layer**: Growth & Maintenance
   - a. Mesenchymal cells
   - b. Blood vessels

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**Composition**: 2 part structure

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**Cartilage Growth**:  
1. **Appositional Growth**: Surface enlargement  
   - Perichondrial Mesenchymal cells become **chondroblasts**  
   - Lay down matrix at surface: **Increase surface dimensions**

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[Diagram of cartilage growth]
2. **Interstitial Growth**: "enlargement within"

- Chondrocytes divide forming: **Isogenic groups**
- Add cartilage matrix:
  - Increasing cartilage density
  - Maturing cartilage
1. Hyaline Cartilage: *Hyalos* = “glass”

- Most abundant cartilage
- Matrix: Chondroitin sulfate & modest collagen fibers
- Weakest cartilage
- Living form: Blueish-white & translucent
- Histologically: Matrix homogenous stain

Examples:
- Larynx, Joint cartilage, ends of ribs
2. Fibrocartilage:

- High concentrations of: **Collagen**
- Strongest cartilage
- Resists *shear and high compression forces*
- Living form: **Macroscopic texturing**
- Histologically: *Highly textured, smaller chondrocytes*

Examples: *Intervertebral disc, pubic symphysis, cartilage of knee*
3. Elastic Cartilage:

- Most flexible cartilage
- High concentration Elastic fibers
- Histologically: Textured dark staining elastin fibers

Examples: Epiglottis, outside ear, tip of nose