**Lecture 6: Muscle Tissues, Cartilage, and Bone Tissues**

**Muscle Tissues: Overview**

Muscle tissue is responsible for body movements, stability, and heat generation. It can be classified into three main types:

1. **Skeletal Muscle Tissue**:
   * Composed of long, cylindrical fibers.
   * Striated (has alternating light and dark bands).
   * Under voluntary control.
   * Found attached to bones and facilitates movement of the skeleton.
   * Multi-nucleated cells, with nuclei located at the periphery.
2. **Cardiac Muscle Tissue**:
   * Located only in the heart.
   * Striated but involuntary.
   * Cells are branched and connected by intercalated discs, allowing for coordinated contractions.
   * Single nucleus per cell, centrally located.
   * Cardiac muscle contractions pump blood throughout the body.
3. **Smooth Muscle Tissue**:
   * Non-striated and involuntary.
   * Found in walls of hollow organs (e.g., blood vessels, digestive tract, bladder).
   * Spindle-shaped cells with a single central nucleus.
   * Responsible for movements such as peristalsis in the digestive system.

**Cartilage Tissue: Overview**

Cartilage is a type of connective tissue that is firm yet flexible, providing support and cushioning. It consists of cells called **chondrocytes** that are embedded in a matrix of collagen fibers and proteoglycans. There are three types of cartilage:

1. **Hyaline Cartilage**:
   * Most common type of cartilage.
   * Found in joints, the nose, trachea, and embryonic skeleton.
   * Provides smooth surfaces for joint movement and supports softer tissues.
2. **Elastic Cartilage**:
   * Contains more elastic fibers, making it more flexible.
   * Found in structures such as the external ear and epiglottis.
3. **Fibrocartilage**:
   * Tough and dense, composed of collagen fibers.
   * Found in intervertebral discs, pubic symphysis, and menisci of the knee.
   * Provides support and absorbs shock.

**Bone Tissue: Overview**

Bone tissue, or osseous tissue, is a hard, mineralized connective tissue that forms the skeleton. It provides support, protection, movement, and mineral storage (especially calcium and phosphate). Bone tissue can be divided into two types:

1. **Compact Bone**:
   * Dense and solid, found on the outer layer of bones.
   * Contains osteons (Haversian systems) with central canals, lamellae, osteocytes within lacunae, and canaliculi.
   * Provides structural strength.
2. **Spongy Bone**:
   * Porous and lighter, found inside bones (particularly at the ends of long bones).
   * Contains trabeculae with spaces filled with bone marrow.
   * Important for producing blood cells in the red bone marrow.