**Lecture 14**

**Muscle tissue, morphofunctional characteristics, classification**

Introduction to Muscle Tissue

Muscle tissue is one of the four primary types of tissue in the human body, alongside epithelial, connective, and nervous tissues. Muscle tissue plays a vital role in various bodily functions, including movement, posture maintenance, and the generation of heat. This lecture will provide an overview of the morphofunctional characteristics of muscle tissue and its classification.

Morphofunctional Characteristics of Muscle Tissue

Muscle tissue is specialized for contraction, which enables movement and force generation. The key morphofunctional characteristics include:

1. **Cell Structure**:
   * Muscle cells, known as muscle fibers, are elongated and contain myofibrils, which are the contractile elements of the tissue.
   * Each muscle fiber is surrounded by a plasma membrane called the sarcolemma and contains a cytoplasm known as sarcoplasm.
2. **Striations**:
   * Skeletal and cardiac muscles exhibit striations, which are alternating light and dark bands visible under a microscope. This striated appearance is due to the arrangement of myofilaments (actin and myosin).
3. **Nucleus**:
   * Skeletal muscle fibers are multi-nucleated, meaning they contain multiple nuclei per cell. In contrast, cardiac muscle fibers usually have one or two centrally located nuclei, while smooth muscle fibers contain a single nucleus.
4. **Control Mechanism**:
   * Muscle tissues can be classified based on their control mechanisms: voluntary (skeletal) and involuntary (cardiac and smooth).
5. **Contractile Properties**:
   * Muscle tissues have varying contractile properties that influence their speed, endurance, and strength, impacting their specific functions in the body.

Classification of Muscle Tissue

Muscle tissue can be classified into three main types:

1. **Skeletal Muscle**:
   * **Structure**: Striated, multi-nucleated, and under voluntary control.
   * **Function**: Responsible for the movement of bones and, thus, locomotion and posture. Skeletal muscles can adapt through hypertrophy (increase in size) in response to training.
   * **Location**: Attached to the skeleton by tendons.
2. **Cardiac Muscle**:
   * **Structure**: Striated, typically mono-nucleated with intercalated disks, and under involuntary control.
   * **Function**: Responsible for the pumping of blood throughout the circulatory system. Cardiac muscle interconnected, allowing for coordinated contractions.
   * **Location**: Found exclusively in the heart.
3. **Smooth Muscle**:
   * **Structure**: Non-striated, spindle-shaped, and contains a single nucleus. It is also under involuntary control.
   * **Function**: Controls various involuntary movements in the body, such as the movement of food through the digestive tract or the contraction of blood vessels.
   * **Location**: Found in walls of hollow organs (e.g., intestines, blood vessels, bladder).

Conclusion

Muscle tissue is essential for performing a wide range of functions critical for survival and daily activities. Understanding its morphofunctional characteristics and classification helps in appreciating its roles not only in movement but also in maintaining overall homeostasis. Future studies can delve deeper into the molecular mechanisms of muscle contraction, adaptation, and the impact of exercise on muscle health.