

Lecture Outline - Muscle

I. Three types of muscle tissue

- A. Skeletal (striated, voluntary)
- B. Cardiac (striated, involuntary)
- C. Visceral or Smooth (nonstriated, involuntary)
  - 1. Single Unit Smooth Muscle
  - 2. Multi-Unit Smooth Muscle

II. Basic Functions of Muscle

- A. Movement (primary)
- B. Maintain Posture
- C. Heat Generation

III. General Characteristics of Muscle

- A. Excitability
- B. Contractility
- C. Extensibility
- D. Elasticity

IV. Skeletal Muscle Gross Structure / Anatomy - each muscle is an organ

A. Modular Anatomy - divided by connective tissue sheaths called fascia

- 1. Muscle (anatomically distinct organ)
  - a. Epimysium – surrounds muscle
- 2. Fascicles - bundles of muscle fibers
  - a. Perimysium – surrounds fascicles
- 3. Muscle Fibers (muscle cells)
  - a. Endomysium - surrounds muscle fibers (cells)

B. Arrangement of Fascicles

- 1. Parallel (straplike or fusiform)
- 2. Pennate
- 3. Convergent (triangular)
- 4. Circular (sphincter)

C. Attachments - fascia are continuous with fascia throughout the body and it is via these fascia that muscles are attached to bone

- 1. Direct Attachment
- 2. Indirect Attachment
  - a. tendons
  - b. aponeurosis

## V. Skeletal Muscle Microscopic Structure / Anatomy

### A. Sarcolemma (plasma membrane)

- transverse tubules (t-tubules)

### B. Sarcoplasm (cytoplasm)

#### 1. Sarcoplasmic Reticulum (related to smooth endoplasmic reticulum)

#### 2. Myofibrils

##### a. I band

##### b. A band

##### c. also H band, M line & Z line

##### d. Myofilaments (cytoskeleton)

- thick filaments - bundles of myosin proteins

- thin filaments - strands of actin proteins (plus troponin & tropomyosin)

- Z-lines

## IV. Physiology of Skeletal Muscle Contraction (in brief)

### A. Sliding Filament Theory

#### 1. Actin-Myosin Interaction

### B. Activation of Muscular Contraction

#### 1. Anatomy of the Synapse

##### a. neuromuscular junction

##### b. neuron terminal

##### c. synaptic cleft

##### d. motor end plate

##### e. motor units

### C. Blood Supply

### D. Fiber Types

#### a. slow twitch

#### b. fast twitch

#### c. intermediate

## VI. Smooth Muscle

### A. Structure / Anatomy

1. Filament Arrangement
2. Gap Junctions

### B. Types of Smooth Muscle

1. Single Unit
2. Multiple Unit

## VII. Cardiac Muscle - to be covered in detail at a later time

### A. Structure / Anatomy

1. Intercalated Disks

## VIII. Clinical Significance

- A. atrophy / hypertrophy
- B. strain / sprain
- C. cramp / spasm
- D. myasthenia gravis
- E. muscular dystrophy
- F. rigor mortis

## IX. Additional Key Terms

aerobic      anaerobic      ATP      atrophy      creatine phosphate      hypertrophy  
isometric      isotonic      tetanus