

**MUSCULAR SYSTEM** (more than just a tissue) – **Ch. 10**  
Human Anatomy lecture

**I. Overview**

A. 3 types of muscle tissue -

**\*Review tissue notes\***

B. Functions

1. Movement
2. Stability
- 3.
- 4.

C. Properties

1. excitability & conductivity
  - 
  -
2. contractility
  - 
  -
3. extensibility
  -
4. elasticity
  -

**II. Skeletal muscle (as an organ)**

A. Connective tissue components **Fig 10.2**

-- listed from most superficial to deep --

1. superficial fascia
  - 
  -
2. deep fascia
  - 
  -
3. epimysium\*
  - 
  -
4. perimysium\*
  - 
  -
5. endomysium
  -

\*Extend beyond muscle to form a tendon -- dense regular c.t.

### III. How skeletal muscles produce movement

#### A. Terminology → KNOW Fig. 10.3

- origin --
- belly
- insertion --

#### B. Fascicle arrangement (relative to tendon)

- influences power and range of motion (Fig. 10.3)
- Ex.:

#### C. Group actions

1. prime mover -  
(agonist) - ex:

2. antagonist -  
- ex:

3. synergists -  
- ex.:

4. fixators -  
-- ex.:

#### D. Lever systems

##### 1. Terminology

-- Insert Drawing --

2. In your body: muscles =  
joints =  
body weight =

3. Relative position of the three determine:
  - mechanical advantage:
  - or
  - mechanical disadvantage:
    - (or a mechanical advantage of <1)
4. Levers trade-off effort - vs.- distance and speed
  - 
  -

#### IV. Microscopic anatomy of skeletal muscle: Fig 10.2 & 10.8

A. Cell = muscle fiber = myofiber

**Drawing:-- Be able to sketch and label a sarcomere**

B. **Sarcomere** – structural and functional unit of a muscle cell: **Fig. 10.10**

“flesh” ←      → “part”

- a. three major protein myofilaments (= microfilaments → part of cytoskeleton)
  - thick
  - thin
  - elastic

- b. form alternating light and dark bands = striations
  - dark A band =
  - light I band (gap between thick filaments) =
- c. muscle contracts by sliding-filament mechanism
  - 
  - NRF detail

C. Muscle cell also has specialized ER, the

D. Sarcolemma has deep invaginations, the

## V. Nerve and blood supply to skeletal muscle

A. skeletal muscles contract voluntarily

B. a motor neuron branches at its end to innervate 3-2000 muscle cells (avg. ≈150).

C. muscle tone is minimal contraction maintained by alternating activity among different motor units.

D. neurovascular bundle supplies the muscle with:

## VI. Growth and regeneration of skeletal muscle

1. skeletal muscle cells can not divide
  - **hypertrophy**
  - **atrophy**
2. if damaged, some new cells can form from satellite cells
  -

## VII. Cardiac muscle

A. Microscopic anatomy (Fig. 10.16, but 20.14, p. 554 is better)

1. Similar to skeletal:
  - 
  -
2. Cells are shorter, branched, and connected end-to-end
3. Intercalated discs contain
  - gap junctions,
  -

RESULT → heart is a single structural & functional unit!

B. Nerve and blood supply

- 1.
- 2.
3. involuntary contraction

--

C. Growth and regeneration

1. growth by adding myofibrils
2. some regeneration (unknown source of stem cells), though most repair is by fibrosis

**VIII. Smooth muscle**

A. Microscopic anatomy (**Fig. 10.16 & .17**)

1. no myofibrils or sarcomeres
2. actin and myosin and intermediate filaments arranged in contractile network
3. cells arranged in two ways
  - a. single-unit (visceral) smooth muscle

-

-

-

- 
- 
- b. multi-unit smooth muscle

-

-

-

B. Nerve and blood supply

- 1.
- 2.
- 3.

-

C. Growth and regeneration

1. hypertrophy is possible; some cells can still divide:
2. new cells can arise from pericytes --

-- **Table 10.4 excellent summary/comparison of muscle types** –  
(NRF all details – see review worksheet)