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 \(\Rightarrow\) 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 =
                  bones =

Muscle -- Page 2 of 5
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:---

B. Sarcomere – structural and functional unit of a muscle cell: Fig. 10.10
   “flesh”  “part”
   Be able to sketch and label a sarcomere:
1. three major protein myofilaments (= microfilaments → part of cytoskeleton)
   - thick
   - thin
   - elastic

2. form alternating light and dark bands = striations
   - dark A band =
   - light I band (gap between thick filaments) =

3. 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. 553 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. 10.16b & .18)
   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)