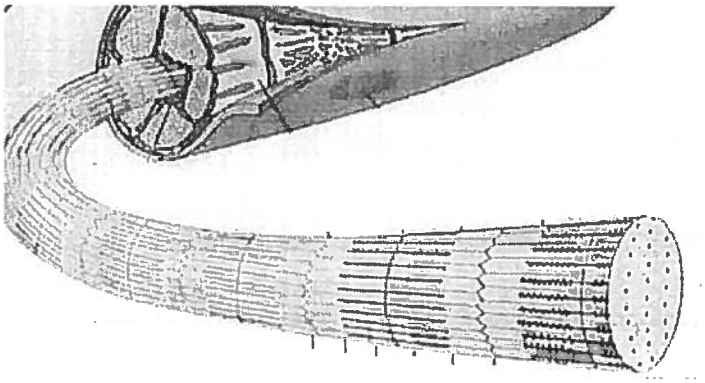

RRC Study Group: ANP 1105

Tuesday October 2nd, 2012 – Session 3
Mentor: Jeremy Chitpin
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Office hours: Thursday 1-2:30pm
(Thompson resource centre)

Study Tip: If you can, set yourself up so you aren't pulling an all-nighter before a midterm. Studies have shown you learn and remember best if you have a good night's sleep before your exam.

1. There are three kinds of muscle tissue. Name each and provide an example. What do all these tissue types have in common that separate them from other tissues?

2. An action potential comes from a nerve cell which innervates a muscle cell. Trace the changes caused by the action potential in the nerve cell up until the release of Ca^{2+} ions from the sarcoplasmic reticulum. Where are these changes occurring? What is the purpose of these changes?

3. What is the main neurotransmitter used to send signals to skeletal muscle and other muscle tissues? Are there others? When might they be used?

4. What happens after the SR releases calcium ions? How do we end up with muscle cell contraction? Cover the cross-bridge cycle.

5. At the top of the page is a picture of a myofibril, composed of many sarcomeres – one of the contractile units in a muscle cell. Pick a sarcomere and label the regions/filaments. Brainstorm a good mnemonic or way to remember these! Draw a picture of the sarcomere after it fully contracts.

6. As we know, action potentials are all-or-none. When a nerve cell is excited, it either depolarizes or it doesn't, and when it does depolarize, the action potential is always the same strength. Yet, I can choose how much strength to use when I pick up a light sheet of paper, compared to heavy anatomy textbook. What are the two ways in which muscles can modulate their force?

7. Let's say you're doing chin-ups. In this example, what would an isotonic contraction look like? An isometric contraction? A concentric contraction? An eccentric contraction?

8. Complete the following table:

Fiber Type	Slow Twitch (I)	Fast Twitch a (IIa)	Fast Twitch b (IIb)
# Mitochondria			
Vascularization			
Glycogen Stores			
Colour			
Recruitment Order			
Fibre Diameter			

MC Questions!

1. The rare and often fatal disease botulism is caused by a bacterium which induces "flaccid paralysis." The botulism toxin causes those afflicted to lose muscle tone in their face first, then the rest of their body. What might be one of the ways that the botulism toxin causes this?
   a) Binds to Na^+ channels on the sarcolemma, constantly activating them, causing an excess of Na^+ ions into the sarcoplasma
   b) Binds to synaptic vesicles containing acetylcholine, preventing them with fusing from the plasma membrane of the axon terminal
   c) Causes ATP to be hydrolyzed on the myosin heads at a faster rate than normal, thus causing the myosin heads to unbind from the actin filament.
   d) Lowers the threshold stimulus required for the recruitment of multiple motor units

2. Calcium binds to the _____ site on _____, allowing myosin to bind to actin.
   a) C ; tropomyosin
   b) I; tropomyosin
   c) T; troponin
   d) C: troponin
   e) None of the above

3. Which of the following sports do you predict would have the highest use of type I fibers?
   a) Crosscountry skiing
   b) Badminton
   c) 100m sprint
   d) Boxing

4. Which of the following statements regarding muscle fiber recruitment is true?
   a) The smallest motorneurons are the weakest, have the lowest functional threshold, and are recruited first
   b) Fast twitch fibers are recruited first, followed by slow twitch fibers
   c) One muscle fiber may be innervated and recruited by multiple motor units.
   d) A motor unit may recruit type I and type II fibers to allow for smoother movement.

5. What is the primary source of energy for Usain Bolt's muscles during his 10s 100m sprint?
   a) ATP and phosphocreatine
   b) ADP and phosphate
   c) Fatty acids
   d) Glycogen

6. Which of the following is **NOT** true?
   a) In order to increase the force output, multiple impulses can be delivered to a muscle to cause fused tetanus
   b) In order to increase the force output, multiple motor units can cause multiple muscle fibers to contract
   c) An isotonic contraction would occur if a muscle could not lift a weight, despite all motor units having recruited muscle fibers, and all fibers undergoing complete tetanus
   d) During a muscle twitch, a latent period exists where an impulse is sent to the muscle but no contraction is observed

7. Which of the following statements regarding skeletal muscle is true?
   a) Titin supports the myosin filaments in the sarcomere
   b) Muscle contractions are dependent on calcium availability
   c) Energy from the hydrolysis of ATP causes myosin heads to detach from actin
   d) Both A) and B)
   e) All of the above

8. Motor units with the lowest ratio of muscle fibers per motor neuron would be seen in which of the following?
   a) Muscles that move the legs
   b) Muscles that move the back
   c) Muscles that move the arm
   d) Muscles that move the fingers

9. Muscle fatigue has been associated with
   a) Depletion of glycogen stores
   b) Depletion of fat
   c) Accumulation of hydrogen ions
   d) Both A and C
   e) All of the above

10. The major function of the sarcoplasmic reticulum in muscle cells is to:
   a) Store glycogen to use as fuel
   b) Store bicarbonate to neutralize hydrogen ions
   c) Store calcium ions for contraction
   d) Store potassium ions and large anions