

Muscle Physiology

Name:

Read through the following questions and scenarios and answer these critical thinking questions. I am NOT looking for long answers and these are not essay questions.

At 5:00 this evening I'll send out another copy of this with the answers. Normally we would have a class discussion on these, but of course that's a bit tricky right now. At some point, read through the answer key I'll send out to see how you did and better understand each question.

1. Ah, caffeine. I do love my morning coffee. Caffeine affects both the central nervous system and muscle fibers. Within muscle fibers caffeine can cause the sarcoplasmic reticulum to become more permeable to calcium. Keeping in mind that the calcium concentration gradient is maintained through constant diffusion and active transport, what effect would caffeine have on muscle contraction as someone consumes more and more caffeine? What might be a “muscular symptom” of drinking too much caffeine?
2. The drug Dantrolene is a muscle relaxer. It reduces how effectively the voltage gated channels open in the sarcoplasmic reticulum. How would this drug help treat muscle spasms?
3. The Krait snake of South East Asia releases a bungarotoxin to its victims. The bungarotoxin binds to sites on neurotransmitters receptors where ACh (acetylcholine) would normally bind. What effect would this neurotoxin have and why would this be an effective way to subdue their victims?



4. The botulinum toxin of the bacteria *Clostridium botulinum* enters the axon terminal and binds to regulatory proteins that regulate the exocytosis of neurotransmitter vesicles. BOTOX treatments use this neurotoxin to help get rid of wrinkles which are caused by muscle contraction.. Why would injecting this neurotoxin help get rid of wrinkles?

5. A deadly neurotoxin in pufferfish and blue ringed octopus, tetrodotoxin (TTX), physically binds to and blocks sodium channels from allowing sodium to pass through. We did not get to studying nerve signals, but this would prevent messages sent from the brain from reaching their target cells. In regards to muscle activity, why could this create a very deadly situation?



6. The black widow venom, latrotoxin, stimulates massive exocytosis of presynaptic neurotransmitter receptacles. What effect would this have on muscle activity and why could this be very dangerous and potentially fatal?



7. Myasthenia gravis (MG) is a common disorder affecting muscle contraction. The concentration of ACh receptors is reduced, as well as the motor end plate being simplified and having lost its typical folded shape. In addition, the body's immune system develops antibodies that bind to and block ACh receptors. What effect would this have on muscle contraction?