

Anatomy 14

Muscle Contraction

Sliding Filament Theory

A muscle contraction must involve:

- action potential(s)
 - calcium ions
 - ATP
1. action potential (AP or neural impulse) propagates down axon of motor neuron to axon terminal (axonal bulb)
 2. AP stimulates calcium protein channels in PM let calcium into bulb
 3. presence of calcium causes vesicles to release neurotransmitters (NT) into synaptic cleft (gap) of neuromuscular junction by exocytosis
 4. NT diffuse across synaptic cleft to sarcolemma of muscle fiber (cell)
 5. NT bind to and alter ion permeability of protein receptors in sarcolemma
 6. AP produced on sarcolemma that travels in all directions
 7. AP on sarcolemma drops down T-tubules into cytoplasm
 8. sarcoplasmic reticulum releases stored calcium
 9. calcium binds with troponin (in actin) to expose binding sites for myosin
 10. ATP & ADP cause binding, pulling and release of myosin and actin
 11. sarcomeres, myofibrils, muscle fibers and entire muscle shorten (contract)
 12. concerted sliding of myofibrils in many muscle cells result in a muscle contraction