CROSS-BRIDGE CYCLE CAUSES MUSCLE FIBERS TO SHORTEN

Muscle Fiber Contraction at the molecular level—role of ATP

At rest, myosin binding is blocked by tropomyosin, a protein that fits into the actin-binding site on actin (therefore, myosin can't bind actin!)

Calcium binds to **troponin**, which releases **tropomyosin** from actin.

Myosin binds to actin and pushes off, releasing a molecule of **ADP**.

ATP binds to the myosin head; myosin **DETACHES** from actin when bound to ATP.

To "cock" the myosin head for another power stroke, a phosphate is used up, converting ATP to ADP.

Myosin again attaches to actin and ratchets……cycle repeats until calcium concentrations fall (due to being pumped back into the SR).

Contraction of a Skeletal Muscle

Graded Muscle Responses: our muscles' ability to adjust to the demands placed on it—it is able to respond differently to weak/strong stimulations and rapidity of stimulations.

If two APs come close together, the second contraction will be stronger than the first (**summation**)

This can lead to a sustained contraction (tetanus—not to be confused with the disease!)

Muscle Fatigue is when the muscle can no longer continue the contraction, despite continued nervous stimulation.

Stronger stimulations result in a greater number of motor units being "recruited".

Smaller motor units recruited before larger ones

This allows for fine motor control

Treppe: The Staircase Effect

after contracting with some frequency (warming up), contractions become stronger with the same level of stimulation

more calcium constantly available

heat generated increases activity of involved enzymes

Muscle Tone: Spinal nerve reflexes alternately contract motor units throughout the day, maintaining muscle health

Isotonic contractions: muscle length changes (iso: same; tonic: tension)

Concentric: muscle does work by shortening

example: lifting a weight, hitting or kicking something

Eccentric: muscle does work by lengthening

example: squatting lengthens the quad but it is contracted to keep from being pulled apart.

Isometric contractions: muscle length remains the same (iso: same; metric: measure)

example: plank pose