Skeletal Muscle Contraction Initiation

The process of contracting skeletal muscle is a well-defined process initiated by nervous system impulses. The somatic motor neuron releases acetylcholine, a neurotransmitter, which activates sodium/potassium channels. Sodium rushes into the cell causing depolarization and action potential generation. The muscle reaches an all-or-nothing threshold, which is an electrical potential value that triggers the opening of voltage-gated channels. In muscles, voltage-gated calcium channels open, allowing for calcium influx. Additionally, the sarcoplasmic reticulum floods calcium into the cytosol. The flood of calcium binds to filaments of the myofibrils.

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Somatic Motor Neuron Releases Acetylcholine
Sumo-tick neuron terminal firing A-seagull-cola
Somatic motor neurons are part of the voluntary nervous system. Upon nerve firing, they release acetylcholine from the nerve terminal, and the acetylcholine activates sodium/potassium channels.

Acetylcholine Causes Sodium Influx
A-Seagull-cola tipping Salt-shaker over into bucket
By activating sodium/potassium channels, acetylcholine allows for sodium influx into the cell, causing depolarization.

Cell Reaches All-or-Nothing Threshold
Scale tipping All the way
The cell reaches an all-or-nothing threshold electric potential value. This means that if the electric potential isn't high enough nothing happens. When it is high enough, the potential is overcome, and this triggers opening of voltage-gated calcium channels.

Voltage-Gated Calcium Channels Undergo Conformational Change
Cow-cage shocked with Gate open
Voltage-gated calcium channels on the cell membrane undergo conformational change and open the mechanically coupled ryanodine receptors on the sarcoplasmic reticulum.

Sarcoplasmic Reticulum Causes Calcium Flood
Shark Rectangle squirting Milk-udders
The sarcoplasmic reticulum responds to the calcium influx and depolarization by releasing its internal calcium storage.

Calcium Flood Enters Myofibrils
Milk landing on Mayo-fibers
This flood of calcium released from the sarcoplasmic reticulum enters myofibrils and binds to filaments to cause contraction.