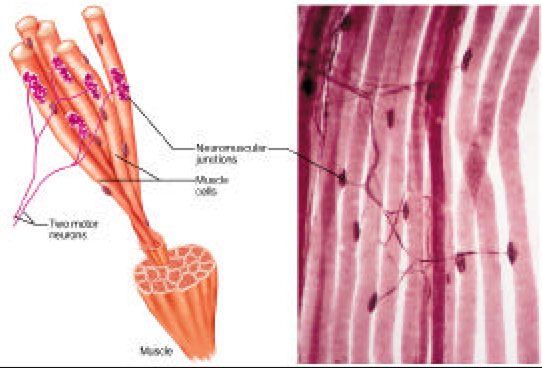
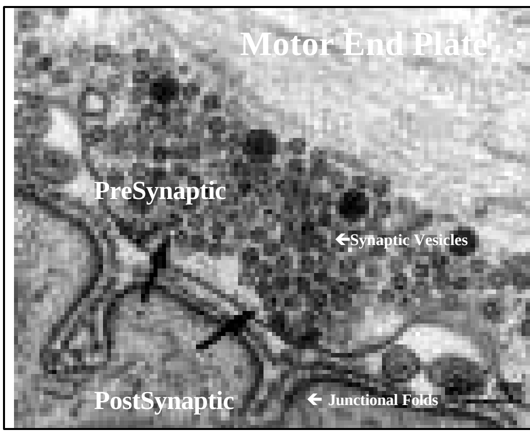
Synaptic Transmission at the NMJ

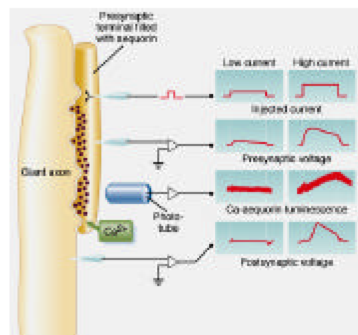
- Mechanisms of N.T. Release
  - Ca^{2+} dependence
- N.T. Inactivation
- Receptor Localization
- Synaptic Plasticity
  - Facilitation
  - Adaptation

Motor Unit

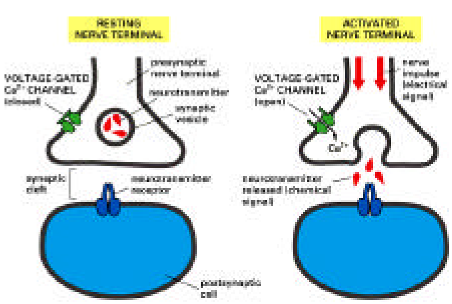




Role of Ca^{2+} in NT Release

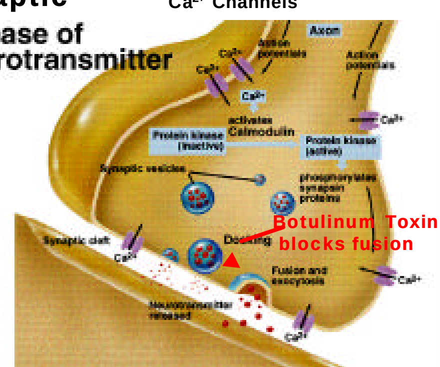


Voltage-Gated Calcium Channels link AP's to Neurotransmitter Release

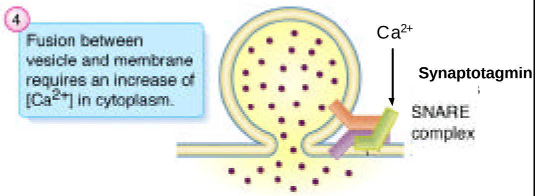


Synaptic Release of Neurotransmitter

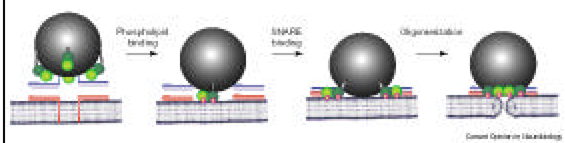
Voltage-dependent Ca^{2+} Channels



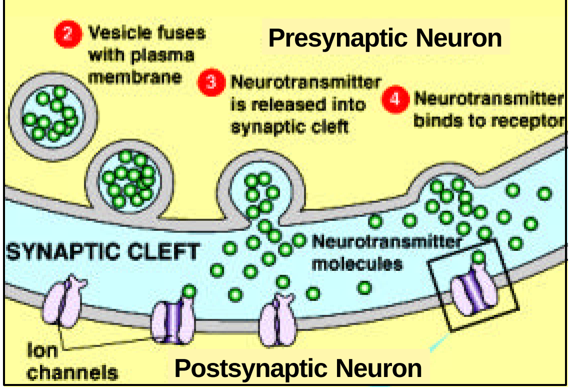
Role of Ca^{2+} in NT Release



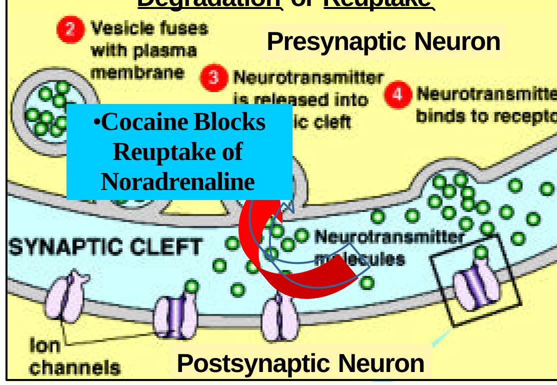
Role of Ca^{2+} in NT Release



How are Neuronal Signals Terminated?

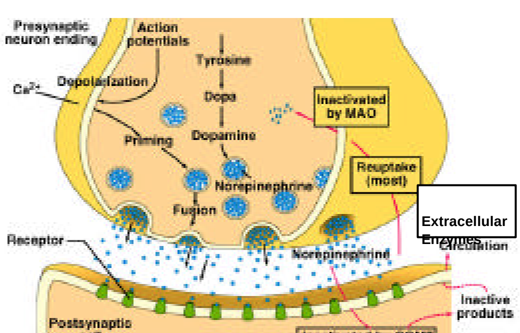


Neurotransmitter Inactivation by Degradation or Reuptake

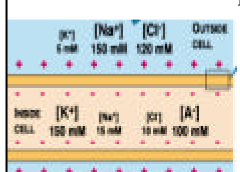


Synaptic Signaling

- Inactivation



The Nernst Equation is a Model for V_m

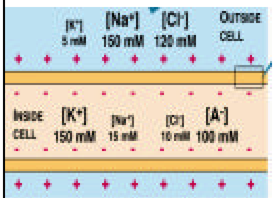


$V_m = E$ for all permeable ions

For > 1 ion use a modification of Nernst called the Goldman Equation

$$E_{ions} = (RT/F) \ln \left[\frac{p_{K+}[K^+]_{out} + p_{Na+}[Na^+]_{out}}{p_{K+}[K^+]_{in} + p_{Na+}[Na^+]_{in}} \right]$$

Opening Channels affects V_m



If a channel is equally permeable to Na^+ and K^+ then…..

$$E_{K,Na} = (.025)\ \ln \left[\frac{1[5]_{out} + 1[150]_{out}}{1[150]_{in} + 1[15]_{in}}\right]$$

$$= (0.25)\ \ln [155/165]$$

$$= -1.56\ \text{mV}$$