

# Physiology 3

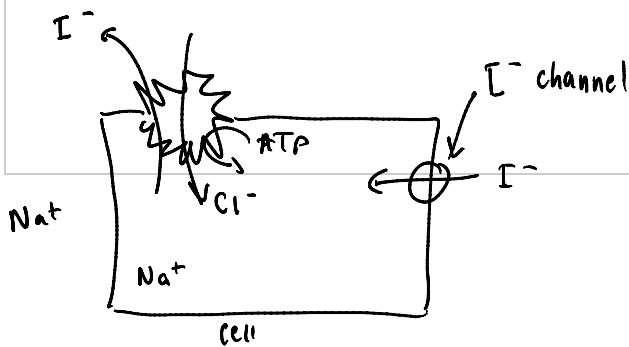
- send answer to iClicker Question 23A now.

## Neurons: Transmission II

- Action Potential
  - demo
  - $\text{Na}^+$  channel
  - demo
- getting back to resting potential
- Animations
- iClicker Question 23B

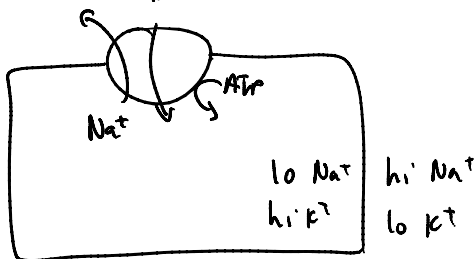
Nothing due in lab **NEXT** week

### Practice - hypothetical cell



- ① pump makes:  $\text{I}^-$  high out  
 $\text{Cl}^-$  high in
- ②  $\text{I}^-$  go in thru channel  
∴ make  $V_m \ominus$   
excess  $\ominus$  inside

### real cell







- Ⓐ add  $\text{K}^+$  channel  $\text{K}^+ \rightarrow \text{out}$   
∴  $V_m \ominus$  "resting potential"
- Ⓑ add  $\text{Na}^+$  channel  $\text{Na}^+ \rightarrow \text{in}$   
⇒  $V_m \oplus$  causes  
"action potential" (signal)

\* if  $\text{Na}^+ > \text{K}^+ \text{ out} \rightarrow V_m \text{ more } \oplus$   
if  $\text{Na}^+_{\text{in}} < \text{K}^+ \text{ out} \rightarrow V_m \text{ more } \ominus$

Add a new player - Voltage-gated  $\text{Na}^+$  channel

Add a new player - Voltage-gated  $\text{Na}^+$  channel

\* when  $V_m$  is  $\ominus$  : closed   no ion flow

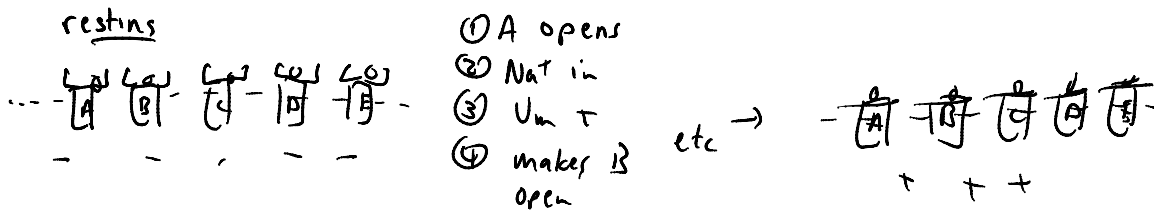
• when  $V_m$  is  $\oplus$  : open    $\text{Na}^+$  only flow freely  
(in)

$\Rightarrow$  that will make  $V_m \oplus$

$\Rightarrow$  more channels opening

$\therefore$  if many Voltage-gated  $\text{Na}^+$  channels in a line  
when 1 opens - it will trigger the next to open  
 $\rightarrow$  cascade of openings  $\Rightarrow$  Action potential



resting




problem : after signal is sent - all are open  
 $V_m$  is  $\oplus$  but can't send another signal

Solution :  $\text{Na}^+$  channel "goes to sleep" after opening

① if  $V_m \rightarrow \oplus$  : open for a little while  

② then inactivate ("sleep") closed & unresponsive to  $V_m$   

③ then, after a little while, "wake up" - closed but ready   
Sense  $V_m$

Final issue : how to get  $V_m$  back to  $\ominus$  resting potential  
after action potential has passed?

Solution :  $\text{K}^+$  goes out (regular : voltage-gated  $\text{K}^+$  channels)  
 $\Rightarrow V_m -$