

# ACTIVE TRANSPORT

10/18/91,rvsd 10/21/92, 10/18/93, 10/14/94, 10/13/95, 16 Oct 00, 15 Oct 01, 20 Oct 03, 20 Oct 04, 17 Oct 05, 22Oct08, 21Oct09  
 BKH: 201-231, 5<sup>th</sup>: , 6<sup>th</sup>: 191-203, 7<sup>th</sup>:

**ACTIVE TRANSPORT:** Requires energy (coupled to energy-yielding reaction, usually ATP hydrolysis)  
 used for: uptake nutrients

removal of waste, etc ( $\text{Na}^+$ )  
 optimal conc of inorganic ions

intrinsically directional, though can facilitate reverse diffusion

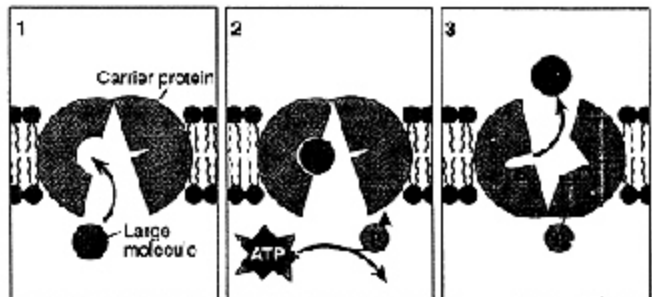
Transport of charged species changes voltage. Rate is affected by both  $V_m$  (memb potential) & conc.

Inside cell is negative, therefore **cations move in easily, move out with difficulty.**

*ACTIVE TRANSPORT MECHANISMS:* (See three classes: p 204, fig 8-7)

**SIMPLE ACTIVE TRANSPORT:**  $\text{Ca}^{++}$  into sarcoplasmic reticulum (see muscle illustration: p 470)

release triggers contraction, Ca pump, ATP driven recovers



**COTRANSPORT:**

**antiport:** solutes transported opposite way:  
 Na/K pump

**EXAMPLE:** Na/K Pump: (see page 214)

- 1) three  $\text{Na}^+$  enter permease which is open to the interior of the cell (three small pockets)
- 2)  $\text{Na}^+$  in permease make it subject to  $\text{PO}_4$ ylation
- 3)  $\text{PO}_4$ ylated permease alters configuration, opens to outside
- 4)  $\text{Na}^+$  diffuses out
- 5) two  $\text{K}^+$  enter permease
- 6) de $\text{PO}_4$ ylation occurs, alters configuration,  $\text{K}^+$  diffuses into the cell.

Na/K pump video: <http://www.youtube.com/watch?v=bGJIvEb6x6w&NR=1>

inhibition of Na/K pump by cardiotoxic steroids (digitalis and ouabain)

**symport:** solutes transported same way:  
 $\text{Na}^+$  and sugars, amino acids (page 215)

**ENERGY SOURCE,** Driven by:  
 either ATP,  $\text{PO}_4$  hydrolysis, or  $\text{Na}^+$  or  $\text{H}^+$

Proton pump: bacteriorhodopsin:  
 light causes *trans* to *cis*, causing release of  $\text{H}^+$  to outside cell causing reversion to *trans*.  
*Trans* form picks up  $\text{H}^+$  from inside cell making molecule susceptible to light transformation.

