

NOTE: PowerPoint handouts are available at

<http://www.whitelab.net> click on "Teaching Files"

Lecture 1: 1/27/010 Membrane Transport

Refs: *Molecular Biology of the Cell*, 5th Edition (2008) Chapter 11, pp 651-667
Boron & Boulpaep Medical Physiology, 2nd Edition (2009) Chapter 5

Relevant papers with more detail than the textbook:

- Guan, L and Kaback, HR (2006) Lessons from lactose permease. *Ann Rev Biophys Biomol Struct* **35**:67-91
- Krishnamurthy, H *et al* (2009) Unlocking the molecular secrets of sodium-coupled transporters. *Nature* **459**:347-355
- Padan, H *et al* (2009) NhaA crystal structure: Functional-structural insights *J Exp Biol* **212**:1593-1603
- Arkin, IT *et al* (2007) Mechanism of Na⁺/H⁺ antiporting. *Science* **317**:799-803
- Schuldiner, S (2006) Structural biology: The ins and outs of transport. *Nature* **443**:156-157
- Seeger, M.A. *et al* (2006) Structural asymmetry of AcrB trimer suggests a periplasmic pump mechanism. *Science* **313**:1295-1298
- Kanner, BI (2005) Molecular physiology: Intimate contact enables transport. *Nature* **437**:203-205
- Yamashita, A. *et al*. (2005) Crystal structure of a bacterial homolog of Na⁺/Cl⁻-dependent neurotransmitter transporters. *Nature* **437**:215-223
- Gadsby, D.C (2007) Structural biology: Ion pumps made crystal clear. *Nature* **450**:957-959
- Adachi, K. *et al* (2007) Coupling of rotation and catalysis in F₁-ATPase revealed by single-molecule imaging and manipulation. *Cell* **130**:309-321
- Higgins, C (2007) Multiple molecular mechanisms for multidrug resistance transporters. *Nature* **446**:749-757
- Aller, SG *et al* (2009) Structure of P-glycoprotein reveals a molecular basis for poly-specific drug binding. *Science* **323**:1718-1722.

Topics

- principles underlying diffusion of solutes through phospholipid bilayers
- the 3 main classes of transport mechanisms, their common properties, and differences
- facilitated diffusion vs active transport
- primary vs secondary active transport
- subclasses of ATP-driven active transporters

Lecture 2: 1/29/10 Membrane, Action, & Synaptic Potentials

Refs: *Molecular Biology of the Cell*, 5th Edition (2008) Chapter 11, pp 667-692
Boron & Boulpaep *Medical Physiology*, 2nd Edition (2009) Chapters 6, 7, 8
Purves et al *Neuroscience*, 2nd edition Chapters 2-7
(Available online: <http://www.ncbi.nlm.nih.gov/bookshelf/br.fcgi?book=neurosci>)

Research papers:

Rivera, C, et al (1999) *Nature* 397:251-255
Katz, B, and Miledi, R (1972) *J Physiol* 224:665-699
Hodgkin, AF (1976) *J Physiol* 263:1-21 (a fun read!)

Topics

- Nernst or equilibrium potentials
- generation of membrane potentials
- processes underlying action potentials
- synaptic transmission