

Last Time

- What is metabolism?
- What type of reaction is this?

amino acids → protein
glycogen → glucose
TAG → CO₂ and H₂O
TAG → CO₂ and H₂O +ATP
ADP and P_i → ATP
glucose → g6p

Cellular Respiration

- glycolysis
- pyruvate to acetyl CoA
- krebs cycle
- ETC
- oxidative phosphorylation

Glycolysis

- 7. four characteristics of first step
- 5. location
- 4. overall reaction
- 6. what happens to products

Numbers (4, 5, 6, 7) from study guide.

[Krebs Cycle]

- 11. Where?
- 12. overall reaction

Numbers (11, 12) from study guide.

[ETC]

- 13. describe
 - What is it made of?
 - What does it do?
 - How does it work?
- 14. location

Numbers (13, 14) from study guide.

[Oxidative phosphorylation]

- 15. describe
 - What is it made of?
 - What does it do?
 - How does it work?
 - Overall reaction.

Number (15) from study guide.

Anaerobic respiration

- No oxygen to accept electrons
- ETC backs up
- Krebs Cycle stops
- Pyruvate isn't converted to Acetyl CoA; instead it goes to lactic acid
- Lactic acid converted back to pyruvate via liver (Cori Cycle)

Number (16, 17) from study guide.

Burning other fuel sources

- Carbohydrates
 - glucose C6
 - glycolysis – 2 pyruvates, 2 ATP and 2 NADH
 - complete cell respiration – 30 ATP
 - 5 ATP per carbon
- Lipids
 - fatty acids – C16
 - beta oxidation – 8 Acetyl CoA, FADH₂, and NADH
 - complete cell respiration – 108 ATP
 - 6.75 ATP per carbon

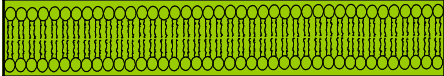
Fuels sources of select Organs

Chapter 6

Movement Across Membranes

What can move through the cell membrane?

nonpolar substance
steroids
oxygen

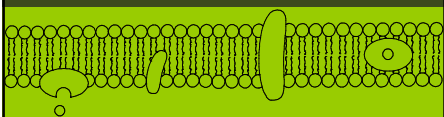


small uncharged molecules
CO₂
urea
ethanol

Everything else requires a protein to move in and out of cell.

water

glucose



proteins, hormones, neurotransmitters

ions (sodium, potassium, calcium)

Two major classes of transporters

- Ones that use energy
active transport
- Ones that don't use energy
passive transport

Passive transport

- No energy required
- Molecules move down their concentration gradient
- Two basic protein types
 - channels and pores
 - carriers (aka facilitated diffusion)

Channels

FOX fig 6.4

Channels = Pores

Access through channels is controlled:

1. gated
 - a. chemical
 - b. electrical
 - c. mechanical
2. not in membrane
 - a. not made yet (aldosterone ex.)
 - b. held inside cell

Channel and Carrier Control FOX fig. 6.15

Protein channel sequestered in cell until stimulus induces movement to the cell membrane

Carriers (facilitated diffusion) FOX fig. 6.14

Characteristics of carriers (like enzymes)

1. specificity
2. saturation
3. affinity
4. competition

Active transport

- Energy required
- Molecules move against their concentration gradient
- Two basic protein types
 - coupled transport
 - pumps

Coupled Transport

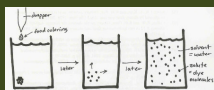
- movement of one molecule down its concentration gradient coupled to movement of another molecule up its concentration gradient
- Two basic types
 - co-transport (symport)
 - both molecules going in same direction
 - antiport transport
 - molecules going in opposite direction

Coupled Transport

Glucose – Sodium cotransporter (Fox fig.6.18)

Diffusion

movement of molecules or ions from a region of high concentration to a region of low concentration



Osmosis

- diffusion of water across a semi-permeable membrane
 - solute can't move through the membrane
 - concentration difference on the two sides of the membrane
- water moves to dilute the more concentrated solution

Osmolarity

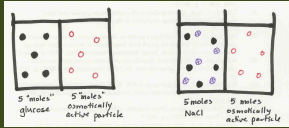
- Water is an essential parameter we regulate.
- We regulate water by maintaining stable osmolarity levels
- Osmolarity = osmoles/liter = Osm
- Osmolarity = Osmolality

Osmolarity

- One osmole = 1 mole of osmotically active particles
- One mole of glucose yields one osmole.
- One mole of NaCl yields two osmoles.

Osmolarity

One osmole = one mole of osmotically active particles.



Calculating osmolarity

- Calculate the osmolarity of a solution containing 10g NaCl/Liter

Why do we regulate osmolarity?

- Intracellular Fluid (ICF) = 300mOsm
- Normal plasma (ECF) = 300mOsm
- Let's consider if ECF changes.

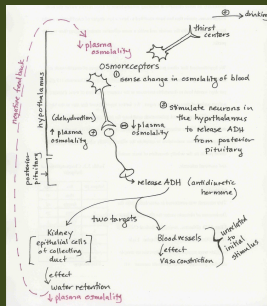
Tonicity

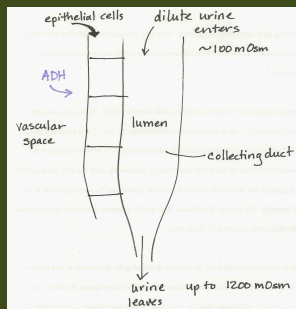
Relative to body fluids:

- Isotonic = 300mOsm
- hypotonic = <300 mOsm*
cells will swell and may burst
- hypertonic = >300 mOsm*
cells will crenate (shrink)

* True if osmotically active particles cannot cross the membrane.

How we control osmolality





Signal Transduction

