Discussion WeekII

Animal Physiology
Discussion Questions and Reading Assignments

Reading assignment: Withers skim beginning Ch. 16 for definitions in list below, also read Water & Ion Budgets pp. 788-790, Vertebrates pp. 798-803, Terrestrial Environments pp. 806-812, Terr. Verts. 822-827. Withers is actually very readable on this topic, and some of it will be familiar to you already:).

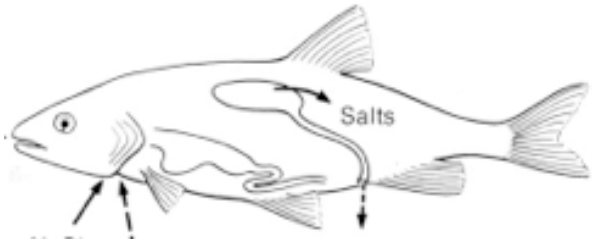
Osmotic and Ionic Balance in Air vs Water

Know:

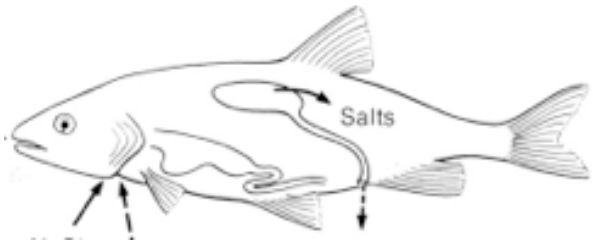
- ☐ definitions: solutes, osmosis, osmolarity/osmolality, ionoregulation, osmoregulation/osmoconforming, compatible solutes, perturbing solutes, counteracting solutes, osmotic permeability (&formulae)
- ☐ The components of Water Budgets (input/output) as well as Ion Budgets
- ☐ The water and ion challenges of freshwater, marine, and terrestrial environments

Discuss:

1. Most animals are ionoregulators even if they are osmoconformers. Why? What is the problem for freshwater vertebrates, too much water? too much salt, or not enough water? Look at the large table on page 2 of the handout. What is the significance of blood concentration relative to the environment, and urine concentration relative to the blood (think about the ways animals have to gain/lose ions)? Indicate high/low salt concentrations (inside/outside fish). With arrows, label the routes of water and ion influx/outflux for freshwater vertebrates on the fish drawing, indicating direction of flow. Indicate passive diffusion/active transport.



2. Now do the same thing for Marine Vertebrates (teleost fishes). What is the problem (what is osmotic concentration of blood to environment/urine to blood)? Routes of water/ion influx/outflux, diffusion/active?



3. Now consider the marine elasmobranch (shark). Be sure to include any special adaptations.

4. Discuss the water budgets of terrestrial vertebrates: amphibians, reptiles, birds, and mammals. Which have bigger total budgets (greater fluxes)? Compare the strategies by discussing major inputs/outputs and whether they have any special adaptations to deal with any particular challenges. What about ions?

5. Why does eating a diet high in protein pose a greater challenge to osmoregulation and excretion? Explain.