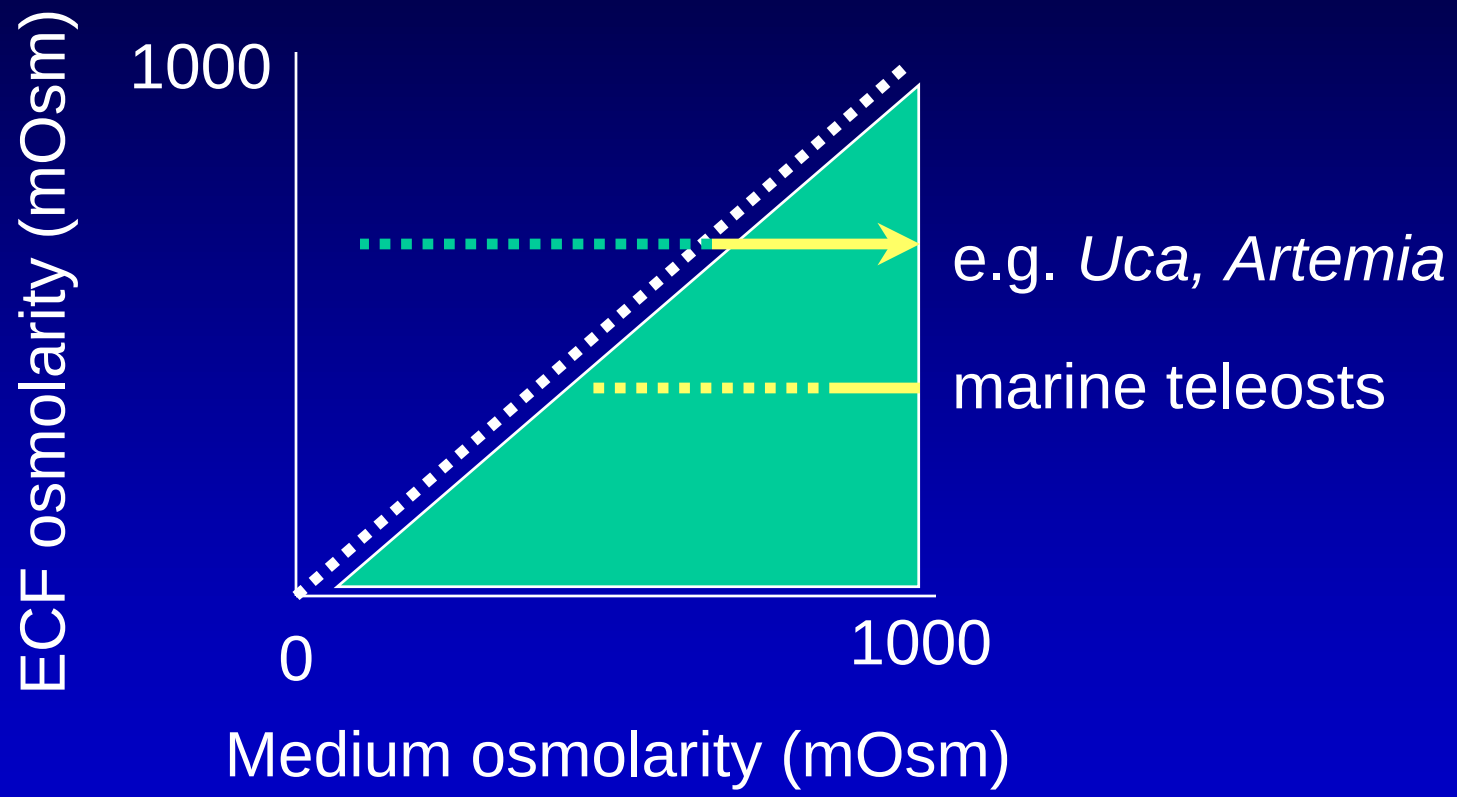
Hypo-osmotic - Hypo-ionic Regulation



Crustacea:

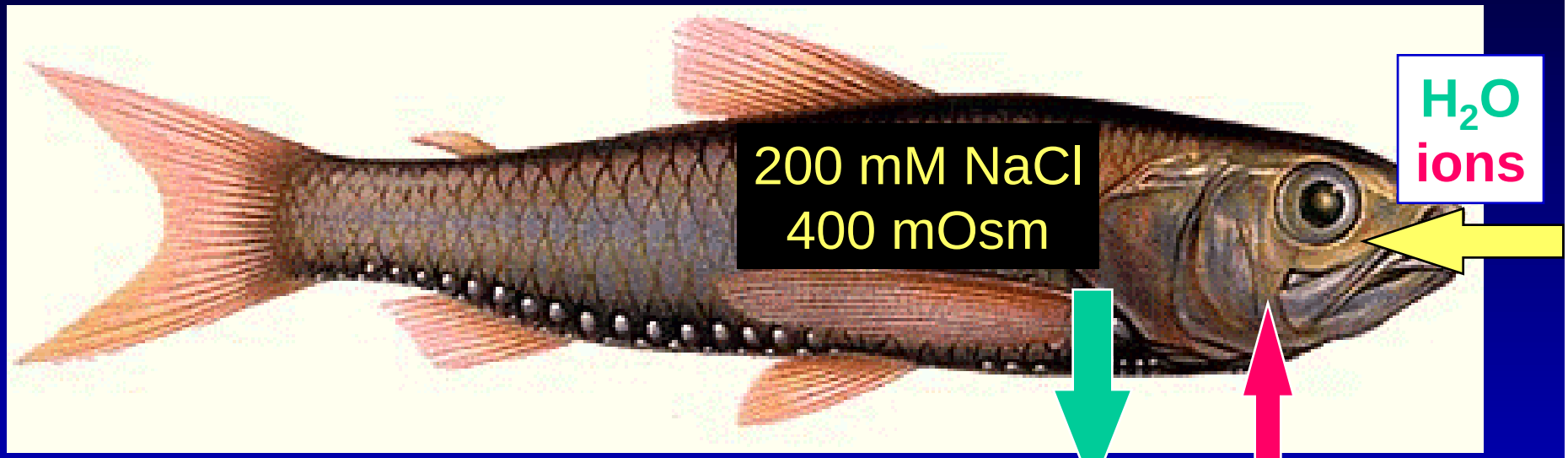
- *Uca* - hemolymph Na = 447 mM in 175% sw (~ 800 mM)

- *Artemia* - hemolymph Na = 300 mM in as much as **4-5 M NaCl !!!**

Marine teleosts

Marine Teleost

(image from Tree of Life)



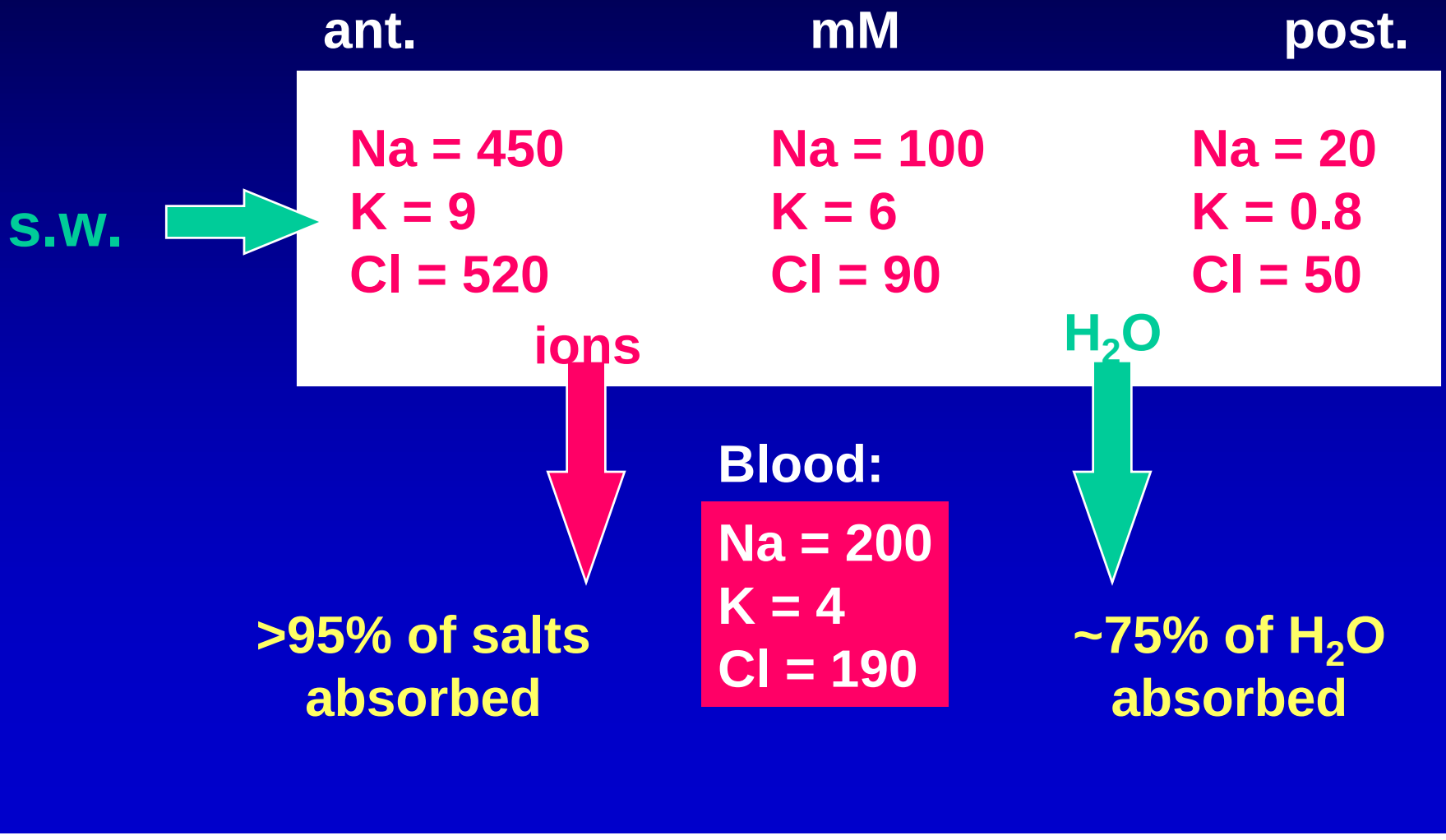
Problems:

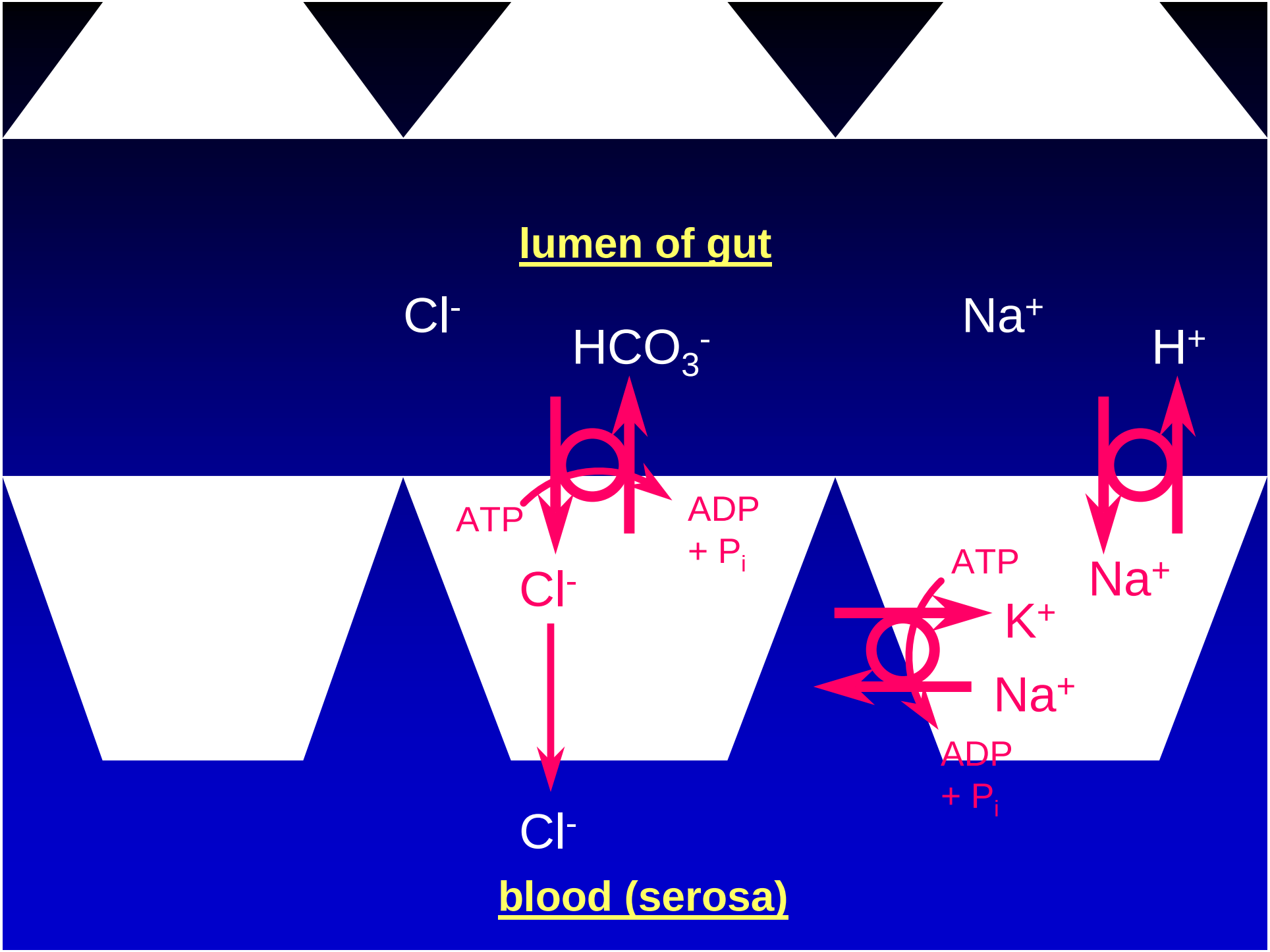
- osmotic water loss
- diffusive salt gain
- ion uptake by gut

Solutions:

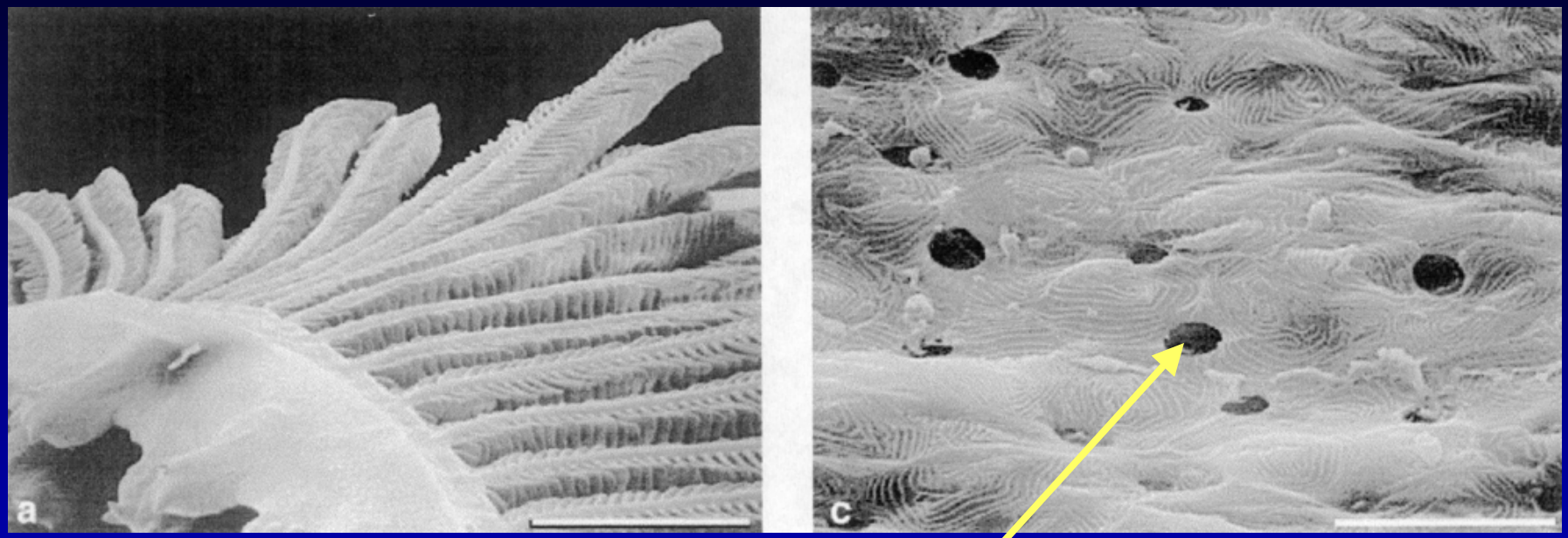
- drink sea water
- active salt extrusion

Fluid absorption across teleost gut:
NO ACTIVE TRANSPORT OF H_2O!
Must move ions and cause H_2O to move by osmosis



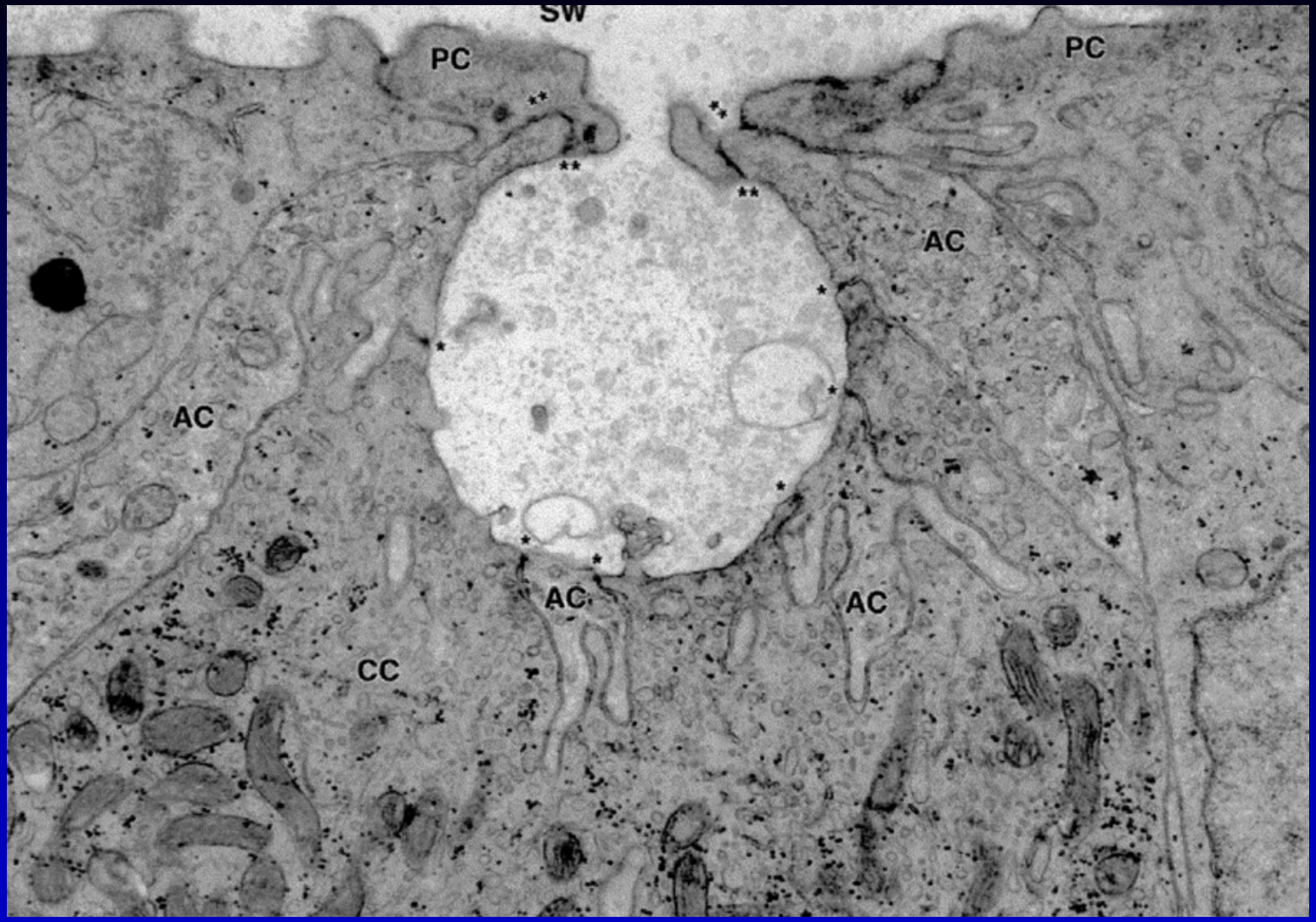

lumen of gut
Cl-
HCO3-
Na+
H+
ATP
ADP
+ Pi
Cl-
ATP
K+
Na+
Na+
ADP
+ Pi
Cl-
blood (serosa)

From Evans et al. (1999) J. Exp. Zool. 283: 641-652.

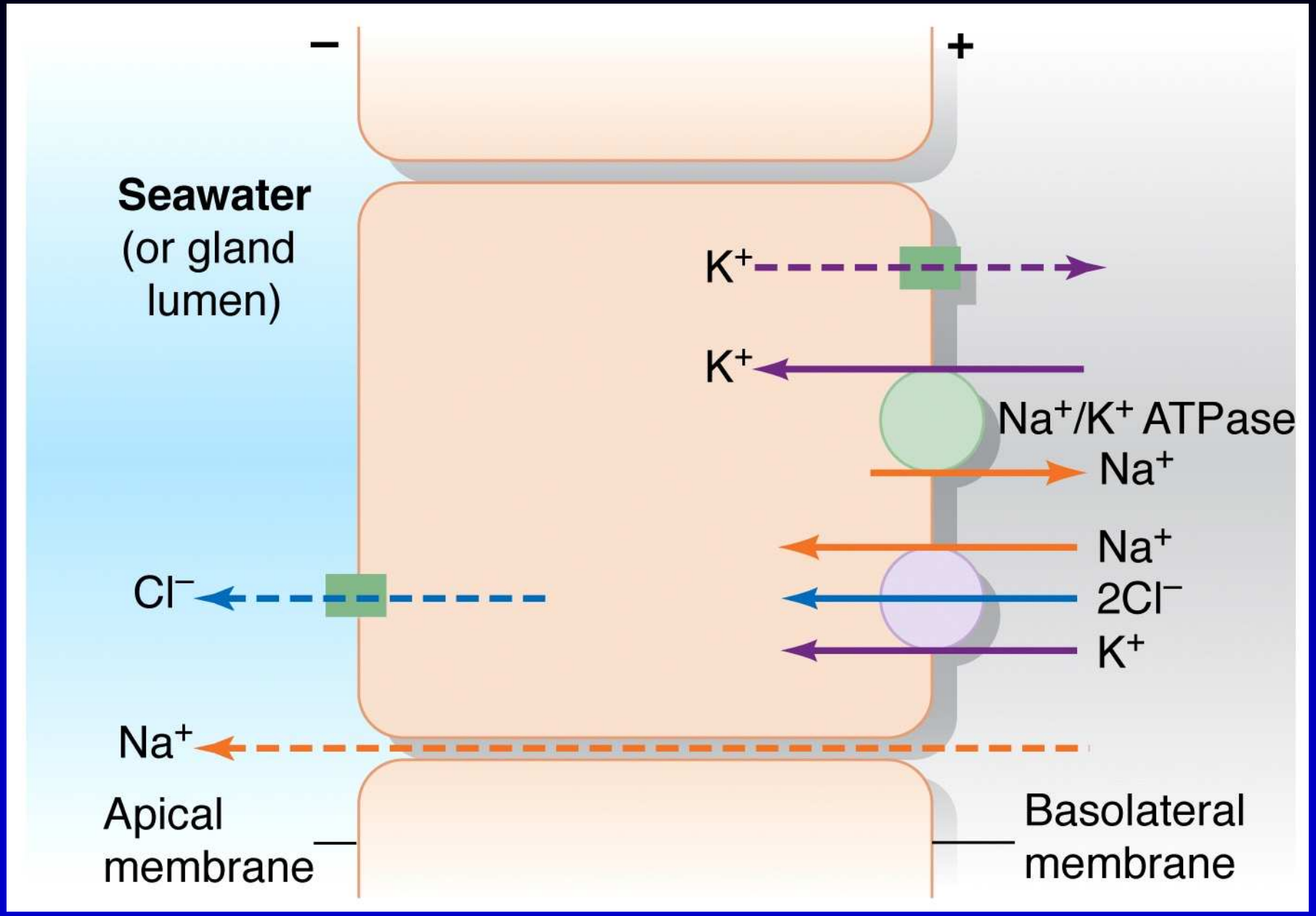


Apical pit of chloride cell on surface of gill lamella

From Evans et al. (1999) J. Exp. Zool. 283: 641-652.



CC - mitochondria-rich chloride cell
AC - accessory cell, PC - pavement cell


−
+
Seawater
(or gland
lumen)
K+
K+
Na+/K+ ATPase
Na+
Na+
Cl−
2Cl−
K+
Na+
Apical
membrane
Basolateral
membrane