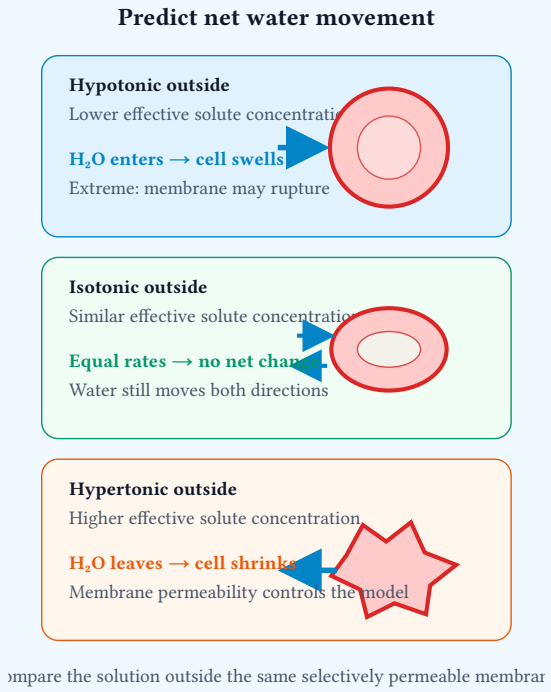
Science 10

Unit C: Cycling of matter in living systems

Membrane equilibrium and applications

Intravenous saline

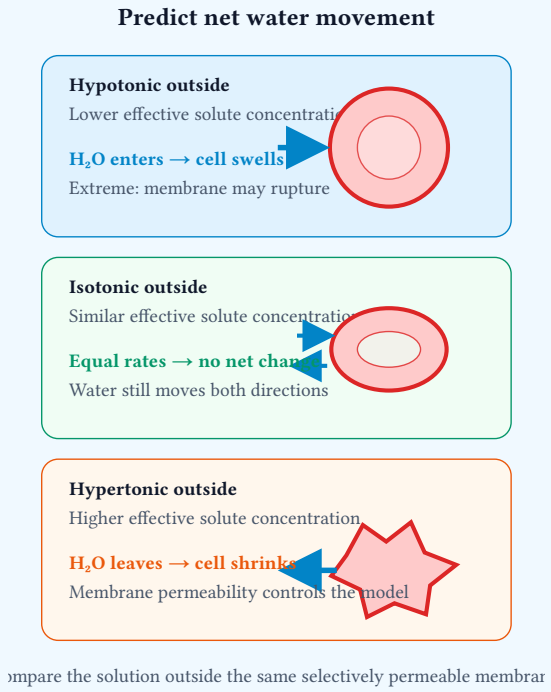
- Red blood cells gain water and may burst in a strongly dilute solution.
- They lose water and shrink in a strongly concentrated solu-tion.



ompare the solution outside the same selectively permeable membrar

Selective permeability

- Predict the direction water moves by comparing the concentrations on the two sides.
- Remember that the membrane lets some particles through and blocks others.



ompare the solution outside the same selectively permeable membrar

Key terms

isotonic

A solution that causes no net water movement into or out of a cell.

hypotonic

A solution with lower effective solute concentration that drives net water movement into a cell.

hypertonic

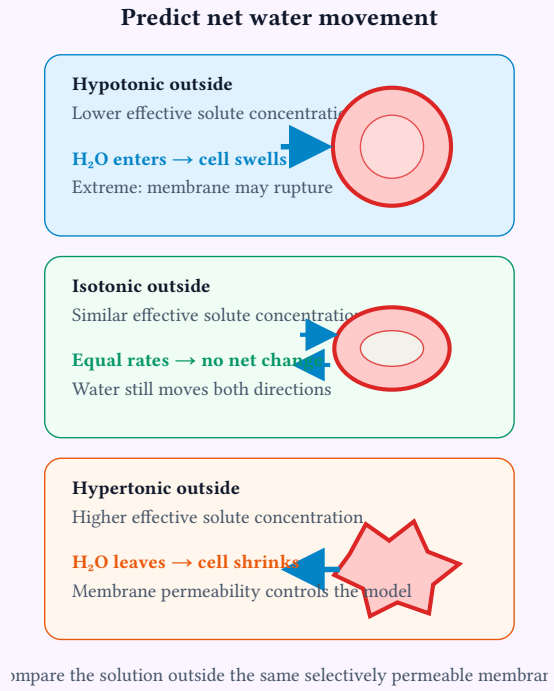
A solution with higher effective solute concentration that drives net water movement out of a cell.

equilibrium

A dynamic state with no net change even though particles continue moving.

Equilibrium

- Particles keep crossing after the concentrations level off.
- Equal rates in both directions are what balanced means here.
- Change the outside concentration and the net water flow changes until a new balance forms.
- A cell can be steady without being frozen in place.



Applications

- Dialysis lets small wastes cross a membrane and holds back cells and large proteins.
- Desalination can push water through a membrane that blocks most ions.
- A high sugar or salt level can preserve food by leaving microbes too little available water.
- The membrane decides which particles are part of the balance.



Cell response

- Predict water movement and cell shape in isotonic, hypotonic, and hypertonic solutions.
- A complete answer gives the direction of the water, uses the relative concentrations, and treats the membrane as selective.

Image credits

James Grellier, Reverse osmosis desalination plant, CC BY-SA 3.0