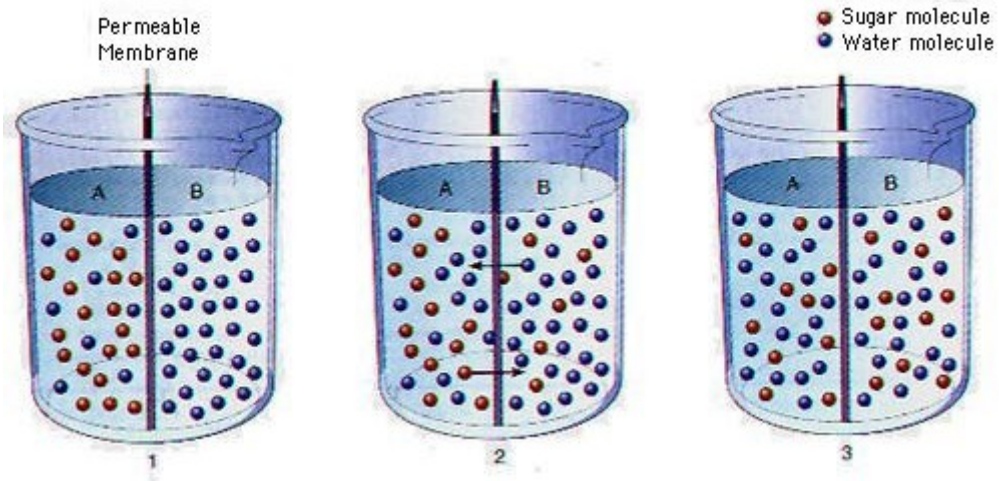
# Lab no 2

## Osmosis and cell membrane integrity

The mechanisms that enable substances to move a cross cell membranes are essential to the life of the cell. Certain substances, for example, must move into the cell to support needed biochemical reactions, while waste materials or harmful substances must be moved out. Mechanisms that move substances across a membrane without using energy are passive processes. In active processes, the cell uses energy from the splitting of ATP to move the substance across the membrane.

**Passive processes;**
Passive process is the processes by which substances move down a concentration gradient from an area of higher to lower concentration or pressure, cell dose not expend energy. The passive processes that will be discuss are; diffusion, osmosis, and filtration.

**Osmosis;** is the movement of solvent molecules, which is water in living systems, across a selectively permeable membrane from an area of higher to lower concentration of water until an equilibrium is reached.
As an example of osmosis;




(1) The container is separated into two compartments by a membrane that is permeable to water and sugar molecules. Compartment A contains both types of molecules, while compartment B contains only sugar molecules. (2) As a result of molecular motions, sugar molecules tend to diffuse from compartment A into compartment B. Water molecules diffuse from Compartment B to Compartment A. (3) Eventually equilibrium is reached.

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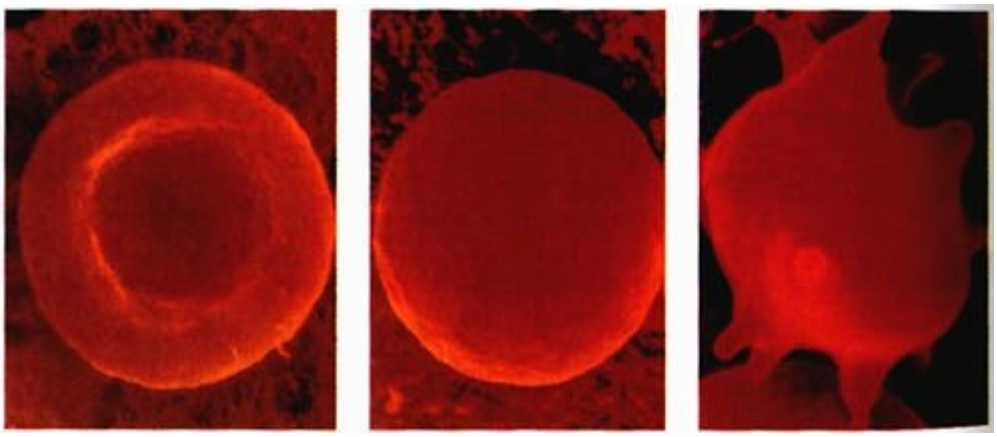
An **isotonic** solution is a solution that has the same concentration of dissolved particles as the solution with which it is compared. In this situation, water enters and leave the cells in equal amounts and the cell remains unchanged.

**Hypertonic** is a condition in which a solution contains a greater concentration of dissolved particles than the solution with which it is compared. In other words, this is a situation where cells (high osmotic pressure) are placed in a solution with a lower osmotic pressure. This creates a net water movement out of the cells and into the fluid surrounding them, causing the cells to shrink.

**Hypotonic** is a condition in which a solution contains a lesser concentration of dissolved particles than the solution to which it is compared. Cells with this condition tend to gain water by osmosis and swell. Even though cell membranes are somewhat elastic, the cells may swell so much that they burst.



(a) If red blood cells are placed in a hypertonic solution, more water leaves than enters, and the cells shrink. (b) In a hypotonic solution, more water enters than leaves, and the cells swells and may burst. (c) In a isotonic solution, water enters and leaves cells in equal amounts, and their sizes remain unchanged.

The swelling or shrinking of cells can damage them. Human cells are about 0.9% saline (salt water). So cells are isotonic to a 0.9% saline solution. Placing cells in distilled water (0% saline) causes water to diffuse into the cells and they hemolyze, or burst. This is an example of a hypotonic solution. But if cells are placed in a solution that is higher than 0.9% saline, water will diffuse from the cells causing them to shrink. This hypertonic solution is caused by the need for the solutions to always be at equilibrium.

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**The Experiment;**

**Purpose;** To determine the effect of the external solution on RBC's.

**Material;**

- Different concentration of saline solution: 0.3% NaCl, 0.9% NaCl, 3.0% NaCl
- Distilled water
- Fresh blood
- Test tube

**Procedure**;

1- Prepare 4 labeled test tubes.

2-Add 4 ml of saline solution to each tube as follow;

⇒ First tube: 4ml of 0.3% NaCl solution.

⇒ Second tube: 4ml of 0.9% NaCl solution

⇒ Third tube: 4ml of 3.0% NaCl solution

⇒ Forth tube: 4ml of distilled water

3- Add 2 drops of fresh blood to each of the fore tube.

4- Shake well, then leaves the tube to stand from 10-30 minutes.

5- Take one drop from each tube and put it on a cleaned & labeled slide then cover it with cover slip.

6- Examine under the microscope using X10 & X40 objective lenses.

7- Record your result then explain it i.e. what happen to the RBC when added to hypertonic solution, hypotonic solution, and isotonic solution.

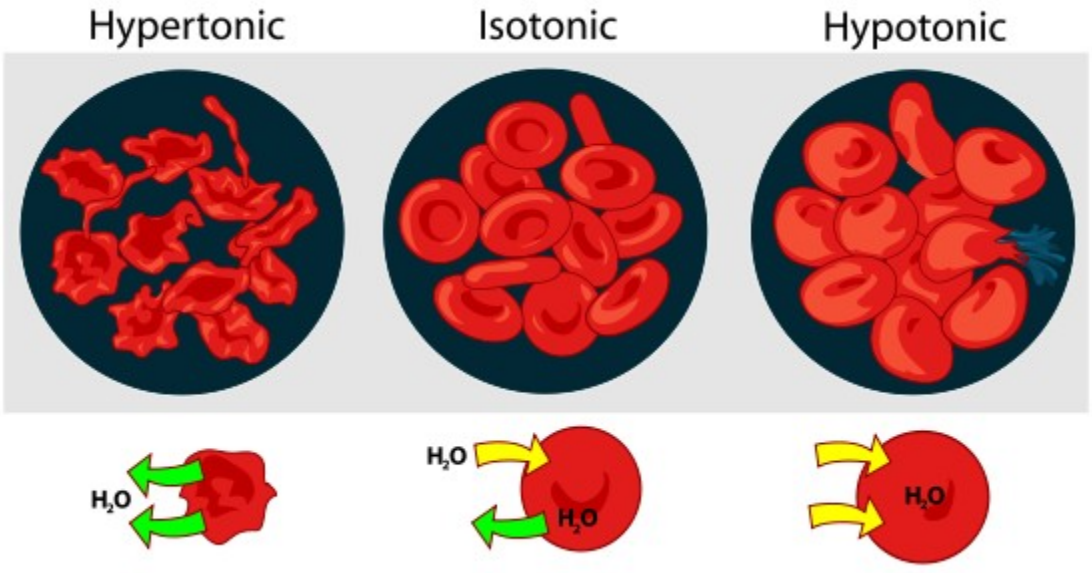


Figure ; effect of different solution on RBC

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