Lab 7

Osmotic Pressure

Process of osmosis

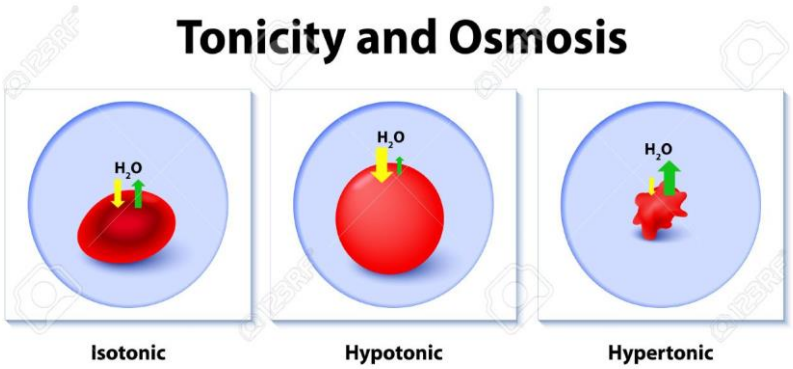
Diffusion of a solvent (usually water molecules) through plasma membrane from an area of low solute concentration to an area of high solute concentration.

Tendency of water to flow from a hypotonic solution (low concentration of dissolved substances) to hypertonic solution (higher concentration of dissolved substances) across a semipermeable membrane(plasma membrane).

Hypotonic: A medium where solute concentration on the outside of the cell are lower than the cytoplasm. May lead to plasmoptysis (the bursting forth of protoplasm from a cell through rupture of the cell wall).

Isotonic: Environments where the solute concentration is the same inside and outside the cell.

Hypertonic: Environments exist when the solute concentration greater on the outside of the cell relative to the cytoplasm and this causes water to diffuse out of the cytoplasm. When this develops, the cell undergoes plasmolysis resulting in a loss of water , dehydration of the cytoplasm, and shrinkage of the cell membrane away from the cell wall. In these situations, considerable and often irreversible damage can occur to the metabolic machinery of the cell.



Microorganisms can be grouped based on their ability to cope with high osmotic pressure:

1-**Halophiles:** require high concentrations of sodium chloride to grow. examples are the halophilic bacteria that require 15-30% sodium chloride to grow and maintain integrity of their cell walls.

2-**Halotolerant:** are capable of growth in moderate concentrations of salt. For example Staphylococcus aureus can tolerate sodium chloride concentrations that approach 11%.

3-**Osmophiles:** which are able to grow in environments where sugar concentrations are excessive.(require high solute concentrations for growth).

Procedure of Osmotic Pressure:

1-*E.coli* bacteria cultivate on nutrient broth at a temperature of 37°C for 24 hours (*E.coli* bacteria can tolerate NaCl concentration that approach 2-5%).

2-Serial dilutions are prepared taken from the previous cultural media and works a series of dilution by placing 9 ml of distilled water in test tubes and added 1 ml to the previous tube and thus operate the other dilution.

3-Taken last diluted and 3 ml divided to three clean test tubes containing

a-The first tube is added 1ml to neutral solution **(Isotonic)** from normal Saline which is the concentration of sodium chloride in it (0.85-0.90)because its Osmotic Pressure equal to the pressure cell.

b-The second tube is added 1ml to **(Hypotonic)** solution of distilled water because it's the Osmotic Pressure much less from pressure the cell which leads to the entry of water into the bacterial cell and can swelling occurs this phenomenon is called **plasmoptysis.**

c-The third tube is added 1 ml to **(Hypertonic)** solution of high salt concentration (NaCl= 8%) because it's the Osmotic Pressure higher from pressure the cell which leads to the pulling of water from the bacterial cell and Shrinkage occurs this phenomenon is called **plasmolysis.**

4-The three tubes are incubated by incubator for one hour.

5-Taken 0.1 ml inoculums from each three tubes and is transferred onto the nutrient agar surface in the plate and is spread.

6-The three plates are incubated by incubator at a temperature of 37°C for 24 hours and read results.