

Lab 5: Selectively Permeable Membranes and Osmosis

Problem: What is a selectively permeable membrane? When does osmosis occur in living cells?

Materials:

cellophane dialysis tubing	iodine
rubberband	15% NaCl solution
80% glucose solution	beakers
distilled water	Benedict's solution
starch suspension	

Objectives: To explain turgor pressure in plant tissues.
To observe how a selectively permeable membrane works.
To observe osmosis in cells placed in varying solutions of salt concentrations.

Cells need to take in food, oxygen, water, and other vital molecules. They also need to excrete waste materials. Some substances are allowed to pass in and out--the plasma membrane surrounding the cells is permeable to those substances. But the plasma membrane is actually selectively permeable. Only certain substances are allowed to pass in and out.

Osmosis is the diffusion of water through a selectively permeable membrane. This occurs when there is an area of greater concentration of water and an area of lower concentration of water. The water moves in the direction from a greater to a lesser concentration.

Procedure:

Part I. Analysis

Turgor is the rigidity or stiffness of plants due to the water present in their cells. Study the drawings on your Data Sheet that depict the presence and loss of turgor pressure. Compare what happens to the vegetables soaked in distilled water with those soaked in salt solution. Also observe the vegetables that were not placed in either liquid. The drawings show the results of an actual experiment.

Study the drawings on the next page. These drawings show the presence and loss of turgor pressure. Then answer the questions based on your understanding of the results.

1. How would you describe the stiffness and texture of the sliced vegetables (not placed in liquid) after an hour?
2. How would you describe the stiffness and texture of the vegetable slices left in distilled water?
3. What happened to the turgidity of the cells left in distilled water?
4. How would you describe the stiffness and texture of the vegetable slices soaked in salt water?
5. Do these slices have greater or lesser turgidity than the slices left out in the air?
6. What conclusions can you draw from the results?
7. Explain the movement of water in this experiment.

Part II. Investigation

A. In order to understand how a selectively permeable membrane works, it's helpful to make a model of a cell. Soak a 20 cm section of cellophane dialysis tubing in water for a few minutes. Rub the ends between your thumb and index finger until the ends separate. Insert a glass rod to hold it open. Twist one end and tie it tightly with string or half of a rubberband.

Remove the glass rod and then fill the dialysis bag 3/4 full with starch suspension and 1/4 full with 80% glucose solution. Tie the top of the bag with string/rubberband. Rinse the outside of the bag with distilled water. Place the bag in a beaker of distilled water. After 20 minutes withdraw a dropper of water from the beaker. Place this liquid in a test tube and add 10 drops of Benedict's solution and heat.

Place 30 drops of the liquid from the beaker into a test tube. Add three drops of iodine. Observe the color of the water after the iodine has been added. (If it turns blue or black, the presence of starch is indicated.) Now add 20 drops of iodine to the water in the same beaker and observe any color changes. Report your results by answering the following questions.

8. Why is it necessary to rinse the dialysis bag with distilled water?
9. What is the purpose of heating Benedict's solution and the (beaker) liquid?
10. What happens when you heat Benedict's solution and some water from the beaker?
11. Explain your results.
12. Do you note any changes in the amount of liquid in the dialysis bag?
13. Is there a change in the amount of liquid in the beaker?
14. What conclusion can you draw from this observation?
15. What is the purpose of adding iodine to the liquid from the beaker?
16. What happens when you add iodine to the liquid from the beaker?
17. Describe any changes when iodine was added to the beaker.
18. If a change has occurred, what does this indicate?