

Osmosis in Potatoes and Beans

Overview One way substances can get into a cell is called passive transport. One special kind of passive transport is osmosis, when water crosses into the cell. This experiment allows you to see the process of osmosis in action. You'll see that the potato slice in the fresh water became a little stiffer, while the potato in salt water became rather flimsy. The question is...why?

What to Learn Cells are made of cells, and the water in the cells flows from areas of low salt concentration to high salt concentration. That means that if the water outside the cell is saltier than the water inside, water will move from the inside of the cell to the outside. As the water left the cell it was like letting the air out of a balloon. As more and more of the cells lost water, the slice of potato became soft and flexible. If the water inside was saltier, the opposite happens, and some water goes into the cells, stiffening them up.

Materials

- 2 potato slices
- Dry beans (about a cup)
- 3 glasses of water
- salt
- a paper towel
- a cookie sheet

Experiment

1. Cut two thin slices of potato. The pieces should be about the same thickness and be slightly flimsy.
2. Place both slices in separate glasses of water.
3. Add salt to one of the glasses.
4. Wait about 15 minutes.
5. Pull out the two pieces of potato and make observations in your science journal.

Let's do this experiment again, but use beans instead of potatoes:

6. Place enough beans and water in a glass to completely fill it.
7. Place the glass on a cookie sheet
8. Leave the glass alone for several hours, overnight is better.
9. While you wait, take out your science journal and write about what you expect to happen. When your experiment is ready, record what you found.
10. Create a data table.

Osmosis in Potatoes and Beans Data Table

Food Item	Describe Flow of Water

Reading

There are two ways substances can get into a cell. The first way substances can get into a cell is called **passive transport**. This process does not require any energy, because of the **concentration** of the substance inside and outside the cell. Concentration is how much of a substance there is in a certain area. In passive transport, the substance is going from an area of high concentration to low concentration. This lab focuses on osmosis, a form of passive transport.

Cells are made of cells, and the water in the cells flows from areas of low salt concentration to high salt concentration. That means that if the water outside the cell is saltier than the water inside, water will move from the inside of the cell to the outside, just like the balloon example. As more and more of the cells lost water, the slice of potato became soft and flexible. If the water inside was saltier, the opposite happens, and some water goes into the cells, stiffening them up.

The beans absorbed the water through osmosis. The water moves from an area of high water concentration (outside of the bean) to an area of low water concentration (inside of the bean), rehydrating the beans and making them expand.

Exercises

For Potatoes

1. How was the concentration of salt different in each cup?
2. Which direction was water flowing in each cup?
3. Why did one potato become stiff, while the other became flimsy?

For Beans

4. The beans should begin to fall out of the water. If you look at them, you will see that they have expanded. What happened?

5. Where was the concentration of water greater – inside or outside of the beans? Explain.

Answers to Exercises: Osmosis in Potatoes and Beans

For Potatoes

1. How was the concentration of salt different in each cup? (The salt water had a higher concentration of salt than the fresh water.)
2. Which direction was water flowing in each cup? (In the salt water, from the potato to the water; in the fresh water, from the water to the potato.)
3. Why did one potato become stiff, while the other became flimsy? (The water moved from areas of low salt concentration to high. Therefore, it moved from the potato into the salt water, making the potato in the salt water flimsy. In the glass without salt water, water moved from low salt concentration (outside of the potato) to high salt concentration (inside the potato), making it firm.)

For Beans

4. The beans should begin to fall out of the water. If you look at them, you will see that they have expanded. What happened? (Water crossed into the bean cells through osmosis. It kept crossing until the beans were at a higher concentration of water than in the water. The beans expanded and fell out of the glass.)
5. Where was the concentration of water greater – inside or outside of the beans? Explain. (Concentration was greatest outside of the beans, because the water moves from areas of high to low concentration.)