Carrot and Celery Osmosis

BIG IDEA

In the film *Superhuman Body,* we learn about some of the body's complex internal systems, including cells of the immune and circulatory system.

MATERIALS

- ☐ Oil
- ☐ Half a tablespoon of salt
- ☐ 4 cups of water
- ☐ Fresh water
- ☐ Baby carrots
- ☐ Celery
- ☐ 2 Containers (bowls, glasses, cups)
- ☐ Marker
- ☐ Sink
- ☐ Paper towels
- ☐ Hand soap
- ☐ Phone or tablet to capture time lapse video (optional)

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ACTIVITY

1. Before beginning this activity, wash your hands well with hand soap and water.
2. Rinse the carrots and celery for this experiment and pat them dry with paper towels.
3. Test the crispness of your carrot and celery stick by trying to bend them and break them in half.
4. Next, taste each vegetable. Check to see if it is crisp and think about how it tastes. Can you describe the taste?
5. Fill one container with two cups of fresh water and another container with two cups of fresh water and half a tablespoon of salt. Mix the salt into the second container of water thoroughly.
6. Use a marker to mark the level of the water in each container and label each container "fresh water" and "salt water."
7. Place several fresh baby carrots and celery stalks into each container.
8. Let the carrots and celery soak overnight in the fresh water and the salt water.
9. *Optional:* Set up a phone or tablet to capture a timelapse video of the osmosis process overnight.
10. Once the vegetables have soaked overnight, first remove the vegetables from the saltwater bath.
11. Test the crispness of the carrot and the piece of celery again by trying to bend them and break them. How is the crispness different from what you observed in Step 3?
12. Rinse the vegetables in salt water to remove salt from the outer portions of the vegetable. Have the same person who tasted the vegetables before the experiment taste them again. Is the taste or texture of the vegetables different than what you experienced in Step 4?

    Can you describe the taste and/or texture?
13. Repeat Step 10 for the vegetables that were in the fresh water. Is the taste or texture of the vegetables different than what you experienced in Step 4? Can you describe the taste and/or texture?

    NOTE: You do not need to rinse the vegetables that were placed in fresh water.
12. Place the vegetables that had been in salt water into a new bowl of fresh water. Let them sit for at least half an hour, and then re-test them.

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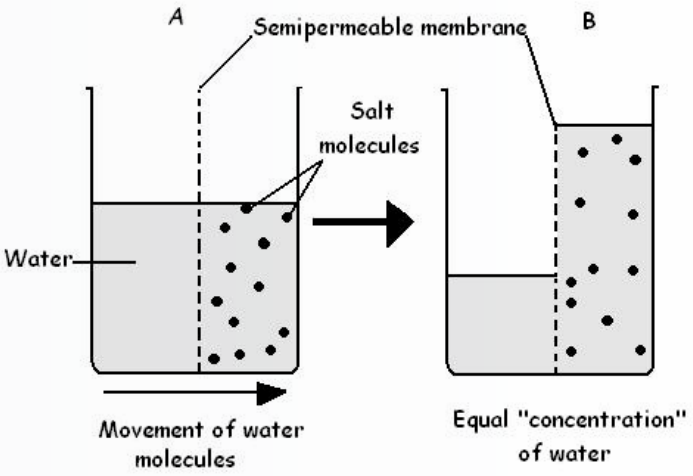
DIG DEEPER

Look at the level of the water in each container. *Did the levels decrease in either of the containers? Where did the water go?*

Would this work with any other fruit or vegetables you have in the house?

Why or why not? What about other items?



WHAT'S THE SCIENCE?

Osmosis: The movement of water through a membrane from an area of lower solute concentration to an area of higher solute concentration.

Semipermeable membrane: A membrane that allows some substances to pass through while preventing others.

Homeostasis: The body's ability to maintain a stable internal environment.

Solute: A substance dissolved in another substance.

Urea: A waste product produced by the breakdown of proteins in the body.

The way living things control the amount of salt inside them is managed by how water moves, a process called osmosis. **Osmosis** is when water moves through the outer layer or membrane of an organism, going towards a place with more salt. The crunchiness of veggies like carrots and celery comes mostly from the water, especially fresh water, inside them. In animals, like humans, osmosis is necessary for maintaining the proper levels of important compounds in cells. This is an important part of **homeostasis.**

In the case of the carrot in the salt water, the carrot becomes less salty than the water around it. So, water leaves the carrot and goes into the salty water, making the carrot less firm and taste saltier. For the carrot in the fresh water, water goes into the carrot because it is saltier than the water around it. This makes the carrot either firm again if it was limp or keeps it crisp if it was already that way. That is why people often store cut carrots and celery in fresh water to keep them the way we like them.

Our bodies also need osmosis. Osmosis helps our cells in the intestinal walls absorb water from the intestine. It controls the movement of **solutes,** dissolved liquids and gases through a **semi-permeable membrane.** This special membrane only lets certain things go in and out of the cell. Osmosis is crucial for getting rid of harmful waste products, like urea, which helps our bodies stay healthy and balanced.

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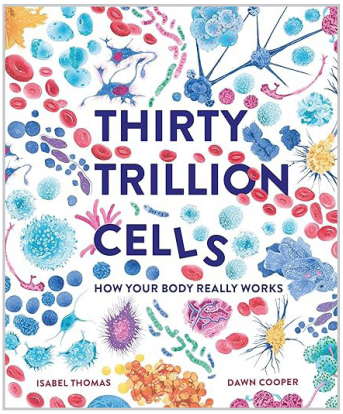
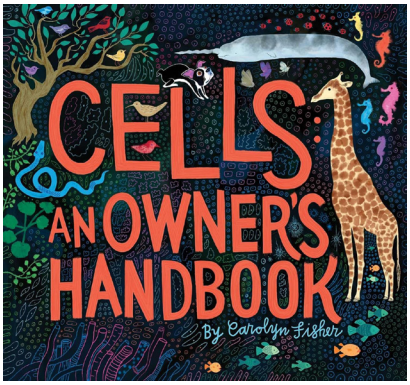
ADDITIONAL LEARNING

READ



Thirty Trillion Cells: How Your Body Really Works by Isabel Thomas explores the intricacies of the human body. It provides an extensive examination of the major systems and organs, offering insights into the tiny things that make us, us. Readers will embark on a journey to understand the human body as a microbiome, uncovering the myriad 'good' microbes numbering in the trillions—that coexist on and within us, actively contributing to our well-being.



Cells: An Owner's Handbook by Carolyn Fisher follows Ellie the skin cell on a journey to meet some of our 37 trillion cells (give or take a few trillion). Ellie explains what a cell looks like, what a cell does, how cells divide and multiply, and much, much more.

WATCH

The Sci Guys: Science at Home SE1 - EP14: "The Naked Egg and Osmosis"
In this video, the Sci Guys perform a surprising experiment where they demonstrate how water moves through the membranes of a very strange egg.

"Transport in Cells: Diffusion and Osmosis" by FuseSchool
This video includes a high-level, but graphical explanation of the ways that particles move naturally through spaces.

DO

Conduct an additional osmosis experiment with a tea bag, hot water, and a clear and colorless container. Place a tea bag in the clear container and pour 8 oz. of hot water over it. Observe what happens.

Prompt learners to articulate their observations using the appropriate scientific terminology. Fundamentally, water flows through the tea bag, driven by osmosis. The tea bag has a permeable membrane that allows for this movement of water to pass through it.

Simultaneously, the tea leaves dissolve, diffusing throughout the water and imparting a brown hue to it.