Water on the Move

Objective

Students will learn why aquatic organisms must maintain a water-salt balance with their surrounding environment. They will develop and test hypotheses and conclude whether experiment results are consistent with proposed explanations.

Materials

- ❑ copies of *Water on the Move* worksheet per student
- ❑ 2 cups
- ❑ 2 one-inch freshly cut celery stalks
- ❑ table salt
- ❑ teaspoon
- ❑ water
- ❑ food coloring

Background

Animals cells require an environment similar to seawater, even when the animals themselves live in fresh water or on land. For animals that don't live in marine environments, maintaining a saline internal environment for cells is difficult.

Water moves from low concentrations of dissolved substances to high concentrations of dissolved substances in a process called osmosis. A solution with high osmotic concentration in relation to its surroundings is hyperosmotic. A solution that has an osmotic concentration that is lower than that of its surroundings is hyposmotic. A solution in which there is neither a net loss nor a net gain of water from its surroundings is isosmotic. Animals must maintain an internal isosmotic concentration. If a cell is placed in a hyposmotic solution, water will be released from the cell and the cell may become dehydrated. If a solution is hyperosmotic, the cell will absorb water. In animals, the kidneys, gills, skin or outer covering, and some other special organs are responsible for maintaining isosmotic body fluid.

Action

1. Review with students the need for organisms to maintain a saline internal environment. What happens to organisms that don't have mechanisms to regulate their water-salt balance with the surrounding environment?
2. Give each student two cups and two pieces of celery. Instruct them to fill both cups with one inch of tap water.
3. Tell them to add four teaspoons of table salt to one of the cups and stir well. Add several drops of food coloring to the other cup and stir. Ask the students which solution will be hyperosmotic in relation to the celery and which will be hyposmotic. Write hypotheses down on the worksheet.
4. Have students place one piece of celery in each cup. Set the cups aside for at least one hour.
5. Have students check their celery after an hour. What has happened to the celery in each cup? Have students record the changes. Were their hypotheses correct?
6. Ask students to answer the discussion questions on the worksheet.

Answers: What would happen to an organism whose osmotic concentration is lower than that of its surrounding aquatic environment. *Water will tend to be drawn out of the organism.* What would happen to an organism whose osmotic concentration is higher than that of its surrounding aquatic environment? *The organism will tend to take in water.*

Name ______________________________

Hypothesis

If I place a celery stick in a solution of salt and water, then ____
____
____.

If I place a celery stick in water, then ____
____.

Observations

Write a description of what happened to the celery in each cup.

celery in water & salt	celery in water & food coloring

Results & Conclusion

Which solution was hyperosmotic? Hyposmotic? How can you tell?

____
____
____
____.

Discussion

What would happen to an organism whose osmotic concentration is lower than that of its surrounding aquatic environment?

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____.

What would happen to an organism whose osmotic concentration is higher than that of its surrounding aquatic environment?

____
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