

Science Lessons for Grades 9-12

“Transition from Cookbook to Inquiry - Observing Osmosis”

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Discipline: Biological Science

Grade: 9 to 10

Standards

Project 2061 Benchmark - Investigations are conducted for different reasons, including to explore new phenomena, to check on previous results, to test how well a theory predicts, and to compare theories. 1B/H1 National Education Science Standards - Cells have particular structures that underlie their functions. Every cell is surrounded by a membrane that separates it from the outside world. Inside the cell is a concentrated mixture of thousands of different molecules which form a variety of specialized structures that carry out such cell functions as energy production, transport of molecules, waste disposal, synthesis of new molecules, and the storage of genetic material.

Purpose/Goal

Students should be able to describe the movement of water molecules as it relates to the relative concentration of solutes on either side of the membrane.

Students should be able to correctly use the terms hypertonic, hypotonic, and isotonic as they relate to osmosis. Students should be able to predict what will happen to cells that are exposed to various solutions.

Context

This activity is best used as part of a unit on cell transport. Students should have some basic knowledge of diffusion and what constitutes a solution.

Preparation

Materials: Grapes, clear containers, water, various solutes, paper towels, and measuring tools.

Website

None

Motivation

The activity begins by giving the students a problem to solve. Thus, it is important to do the activity with minimized information.

Description

Day One: Students are presented with the following problem: Their lab group is asked to create 3 different solutions that will

- 1) cause a grape to increase in size in a measurable way
- 2) cause a grape to decrease in size in a measurable way
- 3) cause no change in the size of a grape

During group planning time, the students should brainstorm and decide the following:

- 1) the types of solutions they can make
- 2) which solution will have what effect on the grape
- 3) an accurate method for measuring a change in the grapes
- 4) how they will record their data
- 5) any safety considerations

Groups should have their plan approved by the instructor. A materials list should be turned in by each group to allow the instructor to assemble needed supplies.

Day Two: The groups gather their materials and set up their experiment. They need to be reminded about taking baseline measurements. Allow the samples to sit overnight.

Day Three: Students will remove the grapes from the solutions, re-measure, and record the data. Students will calculate any changes in the size of the grapes. Students are encouraged to discuss with their group members what has happened to each sample and to write a possible explanation for the results.

The instructor will then give a brief presentation on osmosis, hypertonic, hypotonic, and isotonic solutions relating the grape to a cell with the skin of the grape being the plasma membrane.

Assessment

Written discussion of results - within their groups, students will answer the following:

- 1) What method(s) did you use to determine any change in the size of the grapes?
- 2) What solution(s) caused an increase in the size of the grape?
- 3) What solution(s) caused a decrease in the size of the grape?
- 4) What solution(s) allowed the grape to remain the same size?
- 5) Complete the following sentence for each of the grapes - The external solution of _____ is _____ to the inside of the grape (cytosol) because water moved _____ the grape (cell).