Topic 3: Cells – 3c. Osmosis Egg Lab

Resources:

Drinking seawater can be deadly to humans [Internet]. National Oceanic and Atmospheric Administration. Cited 27 July 2009. Available from: http://oceanservice.noaa.gov/facts/drinksw.html

Robertson, D. (1973). *Survive the Savage Sea.* Dobbs Ferry, NY: Sheridan House, Inc.

Miller K., Levine J. (2004). *Biology.* Boston, MA: Pearson Prentice Hall.

Building on:

Transport of substances across a *cell membrane* can occur several ways. This lab explores the transport of water across the *chorionic membrane* of an egg by *osmosis*. The chorion is one of the *embryonic membranes* that control gas exchange in egg laying birds and reptiles. In placental mammals the chorion will contribute to the development of the placenta (once again controlling gas exchange along with other substances like nutrients). The chorion is permeable to water and whether water will move into or out of the egg will depend on the *extracellular environment*.

This lab takes four days to complete, but only requires a small portion of the class period on each of those days. It can begin with very little introduction. As the days go by and more information about *membrane structure* and *membrane transport* is discussed, students will begin to make the connection between what is happening to the egg each day and osmosis. Terms such as *osmotic potential*, *hypertonic*, and *hypotonic* can be introduced depending on the level of the class.

Links to Chemistry:

Concentration
Solubility
Solutes
Solvents
Ions
Polar versus non-polar molecules

Links to Physics:

Ions
Polar and non-polar molecules
Molecular size
Nanotechnology

Stories:

Similar to the Osmosis Challenge that is listed under Scientific Method on the ARISE Biology website, this lab deals with the diffusion of water across a membrane and the topic of salt and salt water comes to mind. Most students know that it is dangerous to drink salt water, which will actually dehydrate you. This lab can be used to explain why.

A story that applies here comes from a non-fiction account of the survival of a family adrift on the open ocean for 37 days with provisions for only about four days. The book is called, *Survive the Savage Sea,* and it recounts the 1971 experiences of a family after their 43-ft. sailboat was hit broadside by killer whales and sank in less than one minute. Huddled together in a small rubber dingy and a small fiberglass boat, they managed to survive, but the story is about how they survived. Knowing they should not drink the sea water, they first attempted to drink their own urine, but found that to be too salty. They were saved by sea turtles. Sea turtles came up to the rubber dingy, thinking it was another sea turtle and they were able to capture and kill the turtles. They ate turtle eggs and drank turtle blood. The water content of the turtle body fluids was close to that of humans while sea water is about three times saltier than human body fluids. This illustrates the lengths to which people will go to survive and why it is important to know about osmosis!

Materials for the Lab:

- Beakers or plastic cups
- Eggs (one for every two students, if possible)
- White vinegar
- Pancake syrup
- Distilled water
- Digital balance

Name _____

Osmosis Investigation – Egg Lab

Introduction: Bird and reptile eggs are the world's largest single cells and can be used to study the activities of normal microscopic cells. They are especially useful in the study of osmosis. Osmosis is the diffusion of water through a selectively permeable membrane. Water will diffuse into a cell or out of a cell depending on the concentration of water on each side of the membrane. Water will always move from an area of greater concentration to an area of lesser concentration. In this lab, you will observe the effects of osmosis on cells.

Day 1:

1. Mass a fresh egg and record the mass on your data chart.

2. Place the egg in a 250 ml or plastic cup. Add enough vinegar to the container to cover the egg. Cover the container with plastic wrap or aluminum foil and leave it for 24 hours.

3. On your data chart for Day 1 write a hypothesis indicating what you think will happen to the mass of the egg (increase, decrease, or remain the same) and why.

Day 2:

1. After 24 hours in the vinegar, carefully remove the egg with a spoon, pat it dry and mass it. Record the new mass on Day 2 of your data sheet.

2. Rinse out the container, gently place the egg back in the container and add enough pancake syrup to cover the egg. Cover the container and leave it for 24 hours.

3. On your data chart for Day 2 write a hypothesis indicating what you think will happen to the mass of the egg and why.

Day 3:

1. Carefully remove the egg from the cup, rinse the syrup off of it, blot it dry and mass it. Record the mass on Day 3 of your data Sheet.

2. Rinse out the container, gently place the egg back in the container and add enough distilled water to cover the egg. Cover the container and leave it for 24 hours.

Day 4:

1. Carefully remove the egg from the cup, blot it dry and mass it. Record the mass on Day 4 of your data sheet.

2. Dispose of your egg as instructed by your teacher.

Evidence: Data Chart

	Day 1	Day 2	Day 3	Day 4
Mass of the Egg (g)				
Hypothesis (how the mass will change and why)				

Data Analysis:

1. Based on your observations, what effect did the vinegar have on the egg?

2. Was the vinegar (Day 1) a hypotonic, hypertonic or isotonic solution? _____
   Explain how your data and observations support this conclusion.

3. Was the syrup (Day 2) a hypotonic, hypertonic or isotonic solution? _____
   Explain how your data and observations support this conclusion.

4. Was the water (Day 3) a hypotonic, hypertonic, or isotonic solution? _____
   Explain how your data and observations support this conclusion.