Methods of transport across a membrane

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In plant and animal cells, there is a cell membrane that helps maintain the structure of a cell and function. The cell membrane is a biomembrane or biological membrane, which separates and protects the membrane interior cell from its outside environment. It also acts as a selective barrier within or around the cell. The cell membrane is selectively-permeable to ions and organic molecules. The selectively-permeable membrane also controls the movement of substances in and out of cells, by selecting certain kind of molecules. The cell membrane consist of phospholipid bilayer, which is composed of hydrophilic heads and hydrophobic tails with surrounded proteins, which are involved in a range of cellular processes such as Channels for passive transport , cell adhesion and pump for active transport. Due to, the cell being selectively-permeable, only hydrophobic solutions can pass through it by simple diffusion . Thus, not all molecules can pass through it directly , so molecules are being transmitted or pumped into the cell by protein channels or any other method of transport.

There are many methods of transport across membranes. Simple diffusion is the passive transport of non-polar, hydrophobic molecules from a high to low

concentration. Osmosis is the diffusion of water from a region of high water concentration through a semi-permeable membrane to a region of low water concentration. The semi-permeable membrane allows only certain selected particles or molecules, to pass through. Osmosis’s direction of diffusion is determined by its total solute concentration. There are three types of solutions that explain the movement of water (Osmosis).

Hypertonic solution that has a high solute concentration compared to its surroundings. When an animal cell is placed into a hypertonic solution it loses water and shrinks, because water molecules move across the semi permeable membrane from inside of a cell into the surroundings from a region of high concentration to a region of low concentration.

Hypotonic solution has a low solute concentration compared to its surroundings. When an animal cell is placed in a hypotonic solution, the cell is more likely to swell or even die, because the water moves from the surrounding into the cell from a region of higher concentration to a region of lower concentration.

Isotonic solution is one where there is no difference between solute concentrations across the semi permeable membrane. As a result, there is no net movement of water across the membrane, which makes it a normal cell. There are different types of solutions in plants and animals. In animals Hypertonic solution is called Lysed. Hypotonic solution is called Shriveled and Isotonic solution is called Normal.

Research question: How much is the mass of an egg affected by the concentration of solution it is immersed in?

Hypothesis: Cells survival depends on balancing water uptake. According to my knowledge of Osmosis, it is the diffusion of water across membrane. Simple diffusion is the passive transport of non-polar, hydrophobic molecules from a high to lower concentration. Direction of Osmosis is determined by comparing total solute concentrations. There are three different kinds Osmosis. Hypertonic solution passes through membrane from high concentration of solutes to less water concentration. Thus it shrinks. The second kind is Hypotonic solutions, it passes through the membrane from less solute concentration to more water concentration. Therefore it gains a lot of water, and the cell may burst. The third is Isotonic solution, which passes through membrane from equal concentration of solutes to equal concentration of water. Based on my hypothesis, I predict that in higher concentration of NaCl solution, mass will be higher, as the water will be lost . Where in lower concentration of NaCl solution, the mass will be lower, because the egg is more concentrated than the solution, and therefore it will take more water and gain mass in a certain period of time.

Independent variable: The changing variable will be the different concentration of NaCl solution (1M, 2M , 3M, 4M and 5M). These concentrations of NaCl solution are changed , to determine the change in mass of an egg. The change in mass will be determined by dividing the initial and final reading of an eggs mass.

Dependant variable: The initial and final mass of an egg in different concentrations of NaCl solution.

Controlled variable: The time will be controlled by using a stopwatch, because each NaCl solution should be kept for 6 hours, to then determine the final mass of the eggs.

Materials:

5 Beakers of 3 Ã- 250mL beakers.

Electronic balance, set at 0 grams.

Spoon and paper towels.

Sodium chloride solution, with different concentration of NaCl solution (1M, 2M, 3M, 4M and 5M).

5 fresh hen’s eggs.

Stop watch

Google. Omosis. 2006. http://www. purchon. com/biology/osmosis. htm(Accesses on the 20th of November, 2010).

Google. Cell structure. 2010. http://www. tutorvista. com/biology/basic-cell-structure (Accesses on the 26th of November, 2010).

Method:

Place 5 eggs in 5 beakers of dilute acid overnight, for 24 hours to remove the hard shell leaving the membrane intact. Be aware of not destroying the membrane by removing small pieces.

Carefully remove the eggs from the acid with a spoon and rinse under a tap.

Place the eggs on paper towel and gently pat the eggs, till they dry. The eggs should then be measured on a balance, and their mass must be recorded.

To start the reaction, place the eggs on a balance and record, each of their masses in your data table. Also, put a title for the table.

Label 5 beakers, to A, B, C, D & E.

In beaker A, place 1 M of NaCl solution.

In beaker B, place 2 M of NaCl solution.

In beaker C, place 3 M of NaCl solution.

In beaker D, place 4 M of NaCl solution.

And in beaker E, place 5 M of NaCl solution.

Carefully take each egg and place it to one beaker. Remember to immediately start the stop watch till it reaches 6 hours.

While, waiting, write your observations of the reaction of the eggs and solutions.

When the 6 hours are done, take the eggs from the solution gently by a spoon. Then, bring paper towels to dry the eggs.

When the eggs are dried, place each of the eggs on a balance, to determine their mass.

Write your observation and data on your table.

When you have cleaned and washed your equipments. Sit down and determine the percentage change in mass by substituting you final mass , and dividing it by your initial mass, then multiply it by 100:

After determining the change in mass of the egg , verify the type of Osmosis that have occurred in the experiment, variables, materials, safety factors, errors and then you will be ready to write your membrane function lap report. In your lab report, you should then include all these and your discussion and conclusion . When you finished all these, then write you’re abstract and do a table of contents.

The following pictures illustrate the types of Osmosis: This will help you determine the type of Osmosis, when experimenting.

Result/Data

Data collected should be organized in this same manner. If possible put diagrams or pictures, to shows your experiment, which will make clear of your experiment.

Eggs

Solution

Concentration

Mass of egg before the reaction (grams)

Variable control (Time)

Mass of egg after the reaction (grams)

Observation (include any changes, like formation of bubbles , color and shape)

Percentage change in mass (Divide final by initial readings , then multiply it by 100)

To graph the collected data of the different concentration solutions, a line graph should be included. It should provide the percentage change in mass and the concentration of NaCl. The following graph is an example of made up concentrations.