

# Osmosis



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Tonicity refers to the concentration of solutes in a solution (Lab 6-7). There are three stages of tonicity: Isotonic, hypertonic and hypotonic. Four unknown solutions were given and labeled as followed: Solution A, Solution B, Solution C, and Solution D. Since potato cells were used for this type of experiment, in an Isotonic solution the solute and water concentration are the same as inside the cell in which the isotonic solution contains 0.9% NaCl. In other words, water moves in and out in the same amount without causing any changes.

In a hypertonic environment, the solute concentration is greater and water concentration is less outside the potato cell in which the hypertonic solution contains 10.0% NaCl. This solution will cause the potato cells to lose water and shrink and if too much water is lost the cell may die as well. In a hypotonic environment, the solute concentration is lower and there is a higher water concentration outside of the cell. The flow of the water occurs inwards into cells provoking the cells to burst. The term used to describe the bursting of the cells is called (lyse) and then the cells die. The hypotonic solute contains 0.2% NaCl.

### Hypothesis

My first hypothesis for this tonicity experiment was if a piece of potato is immersed or put into the hypertonic solution A, then the solute concentration will be greater and water concentration will be less outside of the cell, which will cause the piece of potato to decrease in size. Moreover, my second hypothesis was if a piece of potato is immersed or put into the hypotonic solution B, then the piece of potato will swell or increase in size by the solute moving inwards inside of the cell. My third and final hypothesis was if a piece

of potato is immersed or put into the isotonic solution C, then the piece of potato will remain the same in size by not having any major changes by the solution.

### Materials and Methods

This experiment was followed as stated on the lab manual (Lab 6-7), General Biology: Study guide and Laboratory Manual. First, I labeled 50-ml beakers A, B, C, and D. Then, I grabbed four potato cubes which were provided by our professor and all four cubes were weighed to the nearest 0.01g (using a tared weighing boat) and then each weight was recorded. Third, each potato cube was placed in each beaker and the unknown solution A, B, C, and D was added to each beaker enough to cover the potato cubes. The next step was to time the cubes and every 15 minutes to check and record the weight of each cube to see the changes occurring. After the last weighing, I had to calculate the percentage weight change for all four cubes from the original weight at each time interval. The formula for percentage calculation was provided as  $\% \text{ weight change (30min.)} = \frac{\text{weight (30 min.)} - \text{weight (0 min.)}}{\text{weight (0 min.)}}$ .

### Results

This section analyzes the results gathered from the experiment diffusion and osmosis as to how potato cells reacted to different types of solutions. Table 1, shows the results of how the potato cubes changed in size after being weighed and recorded every 15 minutes. One cube of potato increased in size when the others decreased and one had slightly changes in size. The potato cube which was immersed in solution A, originally weighed 1.41 grams, cube of potato immersed in solution B, weighed 1.38 grams, cube of <https://assignbuster.com/osmosis/>

potato immersed in solution C, weighed 1.15 grams, and cube of potato immerse in solution D, weighed 1.38 grams. After the first fifteen minutes, the potato cube in solution A, showed a change of 5% in weight, after thirty minutes a -9% change, after forty-five minutes -11% change, after sixty minutes -12% change, and after seventy five minutes showed a change of -13%.

Potato cube in solution B, showed a change of 3% after fifteen minutes, a change of 4% after thirty minutes, a 7% change after forty-five minutes, a 9% after sixty-minutes, and a 10% after seventy five minutes. Potato cube in solution C, showed a change of 1% after fifteen minutes, 0% after thirty minutes, 0% after forty-five minutes, 1% after sixty-minutes, and 1% after seventy-five minutes. Potato cube in solution D, showed a change of -1% after fifteen minutes, -4% changed after thirty minutes, -4% again after forty five minutes, -4% again after sixty minutes, and a change of -5% after seventy five minutes.

### Discussion of Results

The results obtained on the experiment fully supported my three hypothesizes. My first hypothesis was if a piece of potato is immersed or put into the hypertonic solution A, then the solute concentration will be greater and water concentration will be less outside of the cell, which will cause the potato cube to decrease in size. Based on the results shown on table 1, solution A, was definitely a hypertonic solution, according to the author Hoefnagels “ the cell shrivels and may die for lack of water.” Originally, the potato cube weighted 1.41g, after fifteen minutes, the potato cube weighted 1.44g, showing already a decrease on the potato cells. In other words,

solution A contained a higher osmotic concentration than the potato cells because the potato cube was losing weight as the minutes passed by. At the end, the potato cube went from 1.41g to 1.22g in weight.

Next, my second hypothesis was if a piece of potato is immersed or put into the hypotonic solution B, then the potato cube will swell or increase in size by the solute moving inwards into the cells. As table 1, shows the potato cube started with a weight of 1.38g and after fifteen minutes, the potato cube had increased to 1.42g. Then, after thirty-minutes the potato cube had increased in weight to 1.44g and after seventy-five minutes, the cube had reached a weight of 1.52g. These changes in weight show that solution B, contained a lower osmotic concentration and caused the water to flow into cells; making the potato cube to gain weight.

My third and last hypothesis was if a piece of potato is immersed or put into the isotonic solution C, then the piece of potato will remain the same in size by not having any major changes by the solution. Solution C was definitely an isotonic solution because the potato cube did not have major changes in size or weight. The potato cube started with a weight of 1.15g, after fifteen minutes showed a weight of 1.16g, after thirty minutes the weight was back to 1.15g again. After seventy five minutes the potato cube had reached a weight of 1.16g. In this situation, the osmotic concentration was the same in solution C as the same concentration inside the potato cells as well; making the osmotic pressure equally by not having any major changes.

Moreover, solution D was somewhat hypertonic. A hypothesis was not required for this solution. However, the results showed a decrease in weight by the potato cube. The original weight was 1.38g, after fifteen minutes

showed 1.37g in weight, after thirty minutes showed a 1.33g in weight, after forty-five minutes showed a weight of 1.32g, and lastly, after seventy-five minutes the weight was 1.31g. It looks like the solution was hypertonic and the potato cells kept losing water and decreasing in weight.

### Conclusion

The data collected from this experiment supported my three hypotheses that solution A is hypertonic, solution B is hypotonic, and solution C is isotonic. Even though, a hypothesis was not required for solution D, the results showed solution D as a hypertonic solution.