

Cell Size Investigation

Introduction: All cells have an outer layer called the cell membrane that regulates what substances can enter or exit a cell. This ensure that vital molecules like water and nutrients enter the cell and waste products exit the cell. All living cells are dependent on the process of diffusion in order to obtain the essential nutrients they need in order to survive. As cells take in these nutrients, they break them down and use the resulting energy and molecular building block to make more cellular components. This causes a cell to grow by increasing in size. However, cells never get too big, even if the organism is rather large. Cells are always small. In other words, the cells of an ant and a horse are, on average, the same size; a horse just has a lot more of them.

These observations raise an interesting question: **Why are cells so small?**

Here are two possible answers to this question:

- **Explanation 1:** Cells that have a large surface area to volume ratio (surface area divided by volume) are more efficient as diffusing essential nutrients.
- **Explanation 2:** The rate of diffusion (distance traveled divided by time) is related to cell size. Nutrients diffuse through smaller cells faster than they do in large cells.

Getting Started

You can test the validity of these different explanations by constructing a model cell using gelatin. Gelatin is a gel-like substance that you can cut into whatever shape or size you want. Gelatin is a useful materials because chemicals can diffuse through it. Your teacher should have also added a chemical indicator, which is called bromothymol blue, to this gelatin. When bromothymol blue comes in contact with an acid (such as vinegar) it turns from blue to yellow. This allows you to see how far an acid diffuses into your model cell over time.

You will have the following materials available to use during your investigation:

- Bromothymol blue gelatin cubes
- Vinegar
- Beakers
- Ruler
- A plastic knife (to cut the gelatin into different-size cubes or cut the cubes open after they have soaked in the vinegar)

With your group, determine which explanation provides the best answer to the research question. You can use as many of the supplies available to you to test your ideas. Make sure that you generate the evidence you will need to support your explanation as you work. You can record your method and any observations you make.

Our Method:

Our Observations: