

Lab 1: Osmosis and Diffusion: Why Do Red Blood Cells Appear Bigger After Being Exposed to Distilled Water?

Introduction

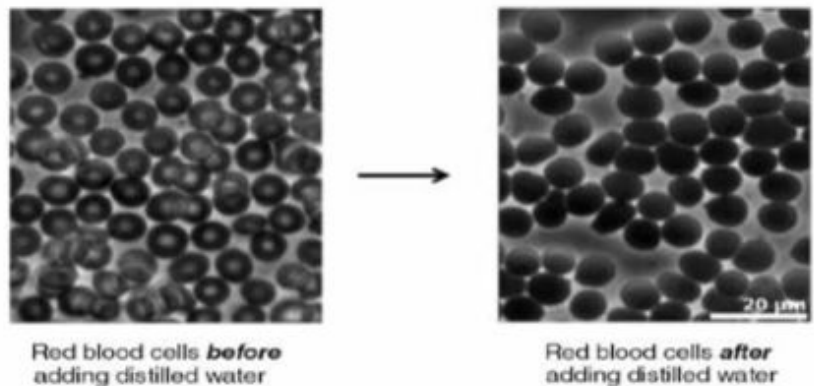
All living things are made of cells. Some organisms, such as bacteria, are *unicellular*, which means they consist of a single cell. Other organisms, such as humans, fish, and plants, are *multicellular*, which means they consist of many cells. All cells have some parts in common. One part found in all cells is the *cell membrane*. The cell membrane surrounds the cell, holds the other parts of the cell in place, and protects the cell. Molecules such as oxygen, water, and carbon dioxide can pass in and out of the cell membrane. All cells also contain *cytoplasm*. The cytoplasm is a jelly-like substance inside the cell where most of the cell's activities take place. It's made out of water and other chemicals.

Some cells found in multicellular organisms are highly specialized and carry out very specific functions. An example of a specialized cell found in vertebrates is the erythrocyte, or red blood cell (RBC). RBCs are by far the most abundant cells in the blood. The primary function of RBCs is to transport oxygen from the lungs to the cells of the body. In the capillaries, the oxygen is released so other cells can use it. Ninety-seven percent of the oxygen that is carried by the blood from the lungs is carried by hemoglobin; the other 3% is dissolved in the plasma. Hemoglobin allows the blood to transport 30–100 times more oxygen than could be dissolved in the plasma alone.

As you can see in the figure to the right, RBCs look like little discs when they are viewed under a microscope. They have no nucleus (the nucleus is extruded from the cell as it matures to make room for more hemoglobin). A unique feature of RBCs is that they can change shape; this ability allows them to squeeze through capillaries without breaking. RBCs will also change shape in response to changes in the environment. For

example, if you add a few drops of distilled water to blood on a microscope slide, the cells will look bigger after a few seconds (see the figure's right panel).

Red blood cells before and after distilled water is added



Scientists often develop and test explanations for natural phenomena. In this investigation you will have an opportunity to design and carry out an experiment to test two different explanations for why RBCs appear bigger after they are exposed to distilled water. These are the two explanations that you will test:

1. Molecules such as protein and polysaccharides are more concentrated inside the cell than outside the cell when the cell is in distilled water. These molecules therefore begin to move out of the cell because of the process of diffusion but are blocked by the cell membrane. As a result, these molecules push on the cell membrane and make the cell appear bigger.
2. Water molecules move into the cell because the concentration of water is greater outside the cell than it is inside the cell. As a result, water fills the cell and makes it appear bigger.