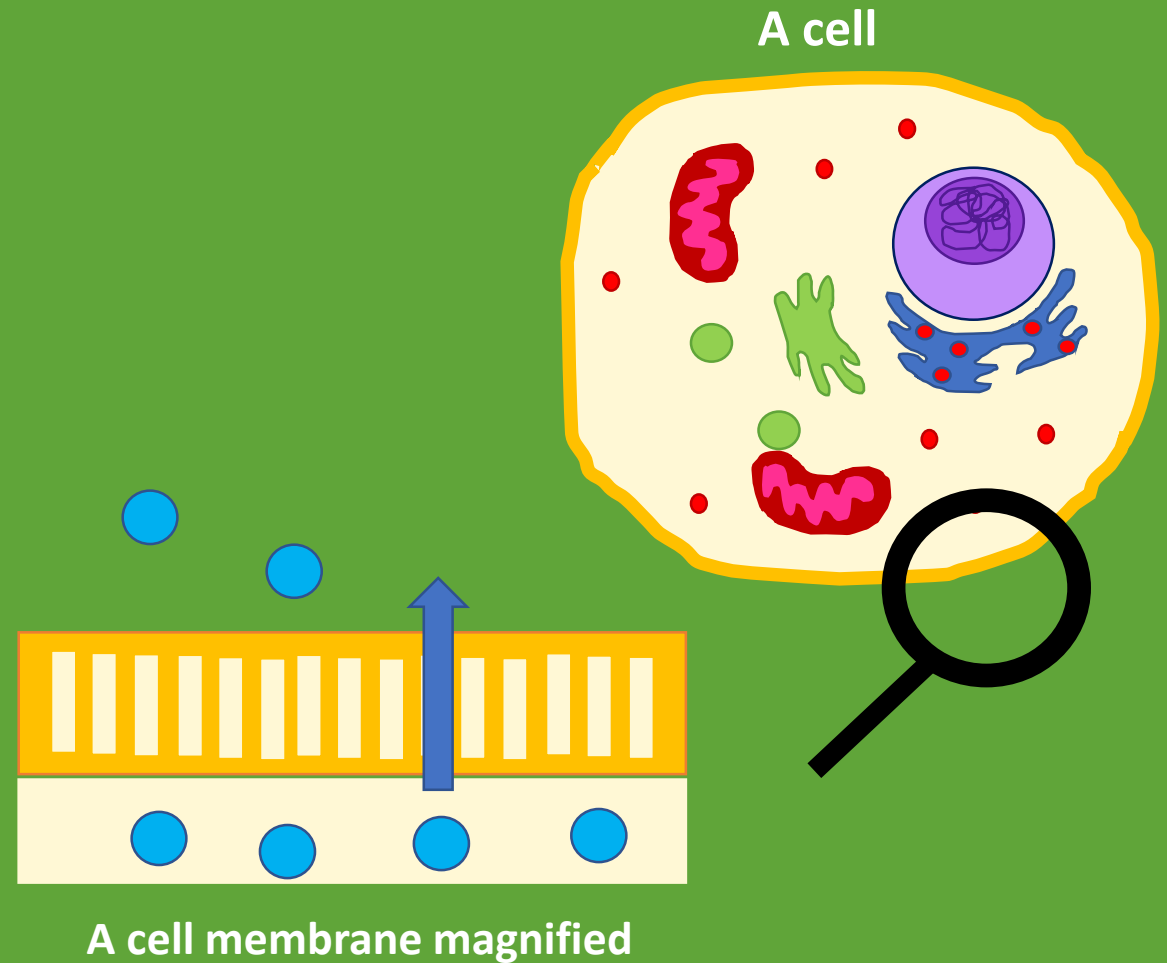


Gummy Bear Chemistry and Osmosis

Michigan Department of Health and Human Services
Bureau of Laboratories

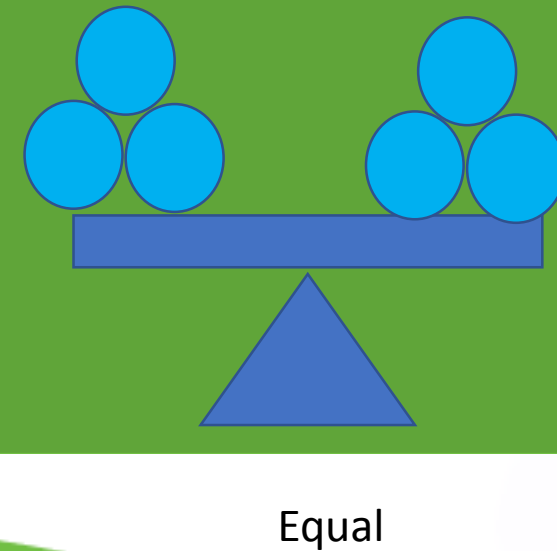
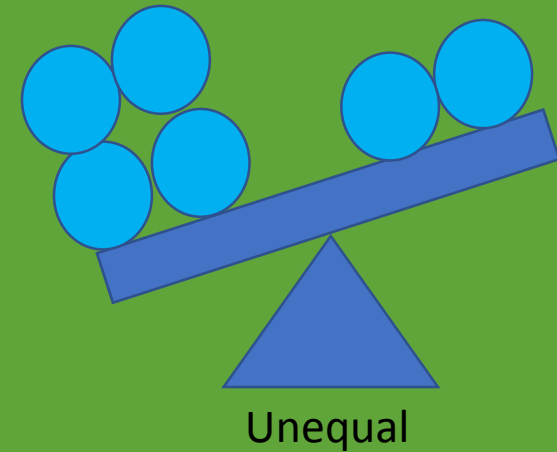
The Cell Membrane

- Cells are surrounded by a lipid bilayer, which is a semi-permeable membrane.
 - **Semi-permeable** means that only small molecules, like water and oxygen, can pass into and out of the cell.
 - The cell membrane protects the cell from the outside environment.
 - It also keeps the cell's organelles, ions, proteins, and water inside so the cell can stay healthy and alive

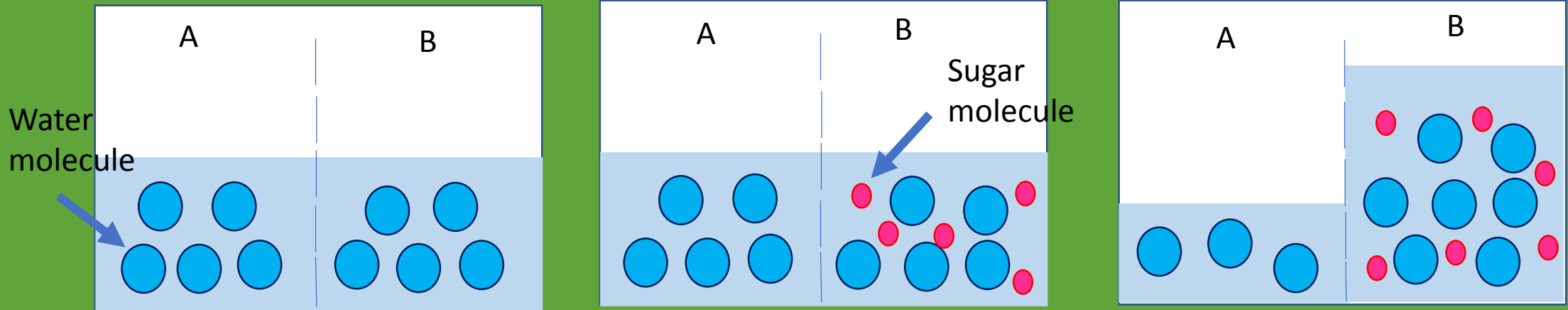


Osmosis and Equilibrium

- When there are an unequal number of molecules inside and outside the cell, the concentration difference causes water to move across the membrane.
- Water molecules move from an area of low concentration to a high concentration, until the concentrations are equal.
- Water stops moving when there is equilibrium, or the same concentration, on both sides of the cell membrane.



How Osmosis Works



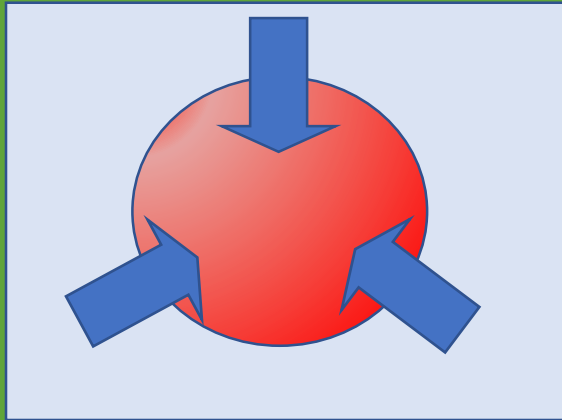
There is an equal number of water molecules on each side of the membrane (Isotonic).

When sugar molecules are added to side B, it becomes hypertonic because there are more sugar molecules than side A.

Water moves across the membrane, from the less concentrated (hypotonic) side A to the more concentrated (hypertonic) side B, until the concentration is equal on both sides. This is called equilibrium.

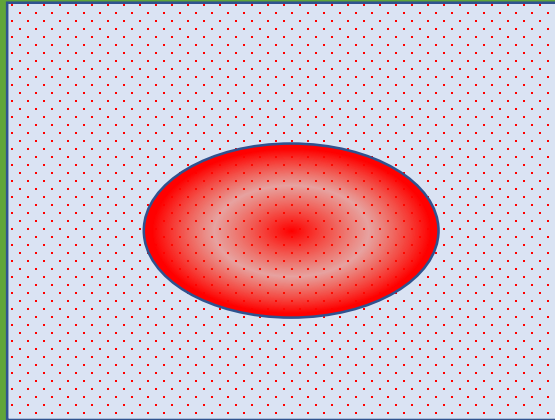
Osmosis in Red Blood Cells

Hypotonic



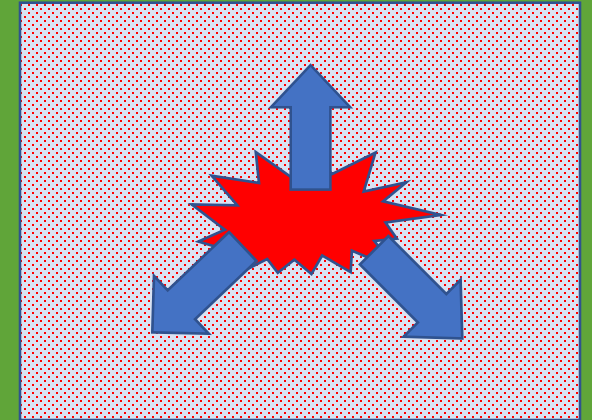
There is a higher concentration of molecules in the cell, so more water moves into the cell and the cell swells

Isotonic
(normal)



The concentration of molecules are equal inside and outside the cell. The cell is in equilibrium.

Hypertonic

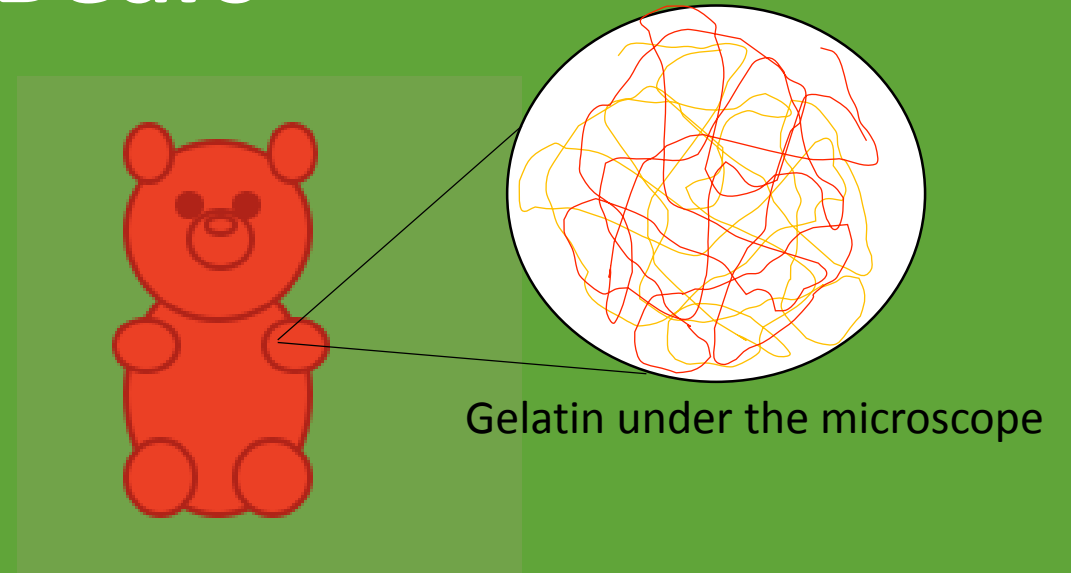


There is a higher concentration of molecules outside the cell. Water moves out of the cell and the cell shrinks

Science behind Gummy Bears

Gummy Bears are made of solid Jell-O like substance, known as gelatin, and sugar.

- Gelatin is made when collagen, a type of protein, is heated with water, then cooled.
- These proteins are mixed and cooled, they form chains with strong bonds.



Interesting fact: Collagen proteins are also found in bones and other tissues through the body.

Gummy Bear Chemistry

Supplies

- Gummy Bears (Black Forest work best)
- 1 cup of water
- 1 cup of salt water
- 1 cup of vinegar
- 1 cup of water with baking soda
- 1 cup of sugar water



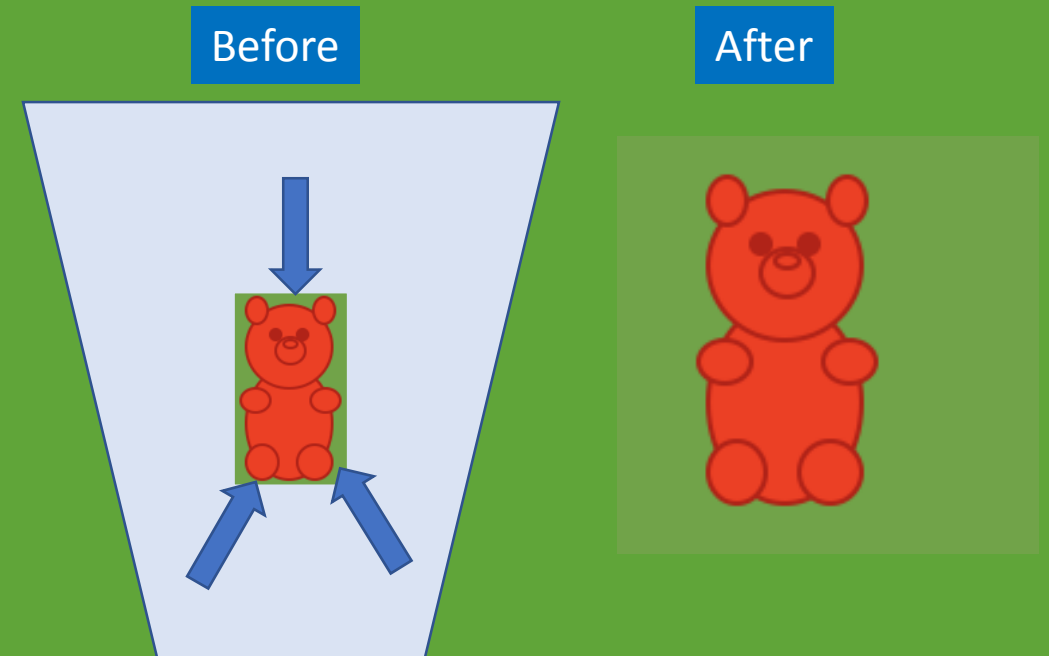
Experiment

- Fill 4 cups with water at room temperature.
 - Leave one cup with just water.
 - Stir in one tablespoon of salt in another glass.
 - Stir in one tablespoon of baking soda in another glass.
 - Stir in one tablespoon of sugar into another glass.
 - Add vinegar to the last cup.
 - Measure the mass, length, width and note the color of each gummy bear.
- Record this data in the chart.
- Place one gummy bear in each cup. Wait 12-48 hours. Now, record your observations.



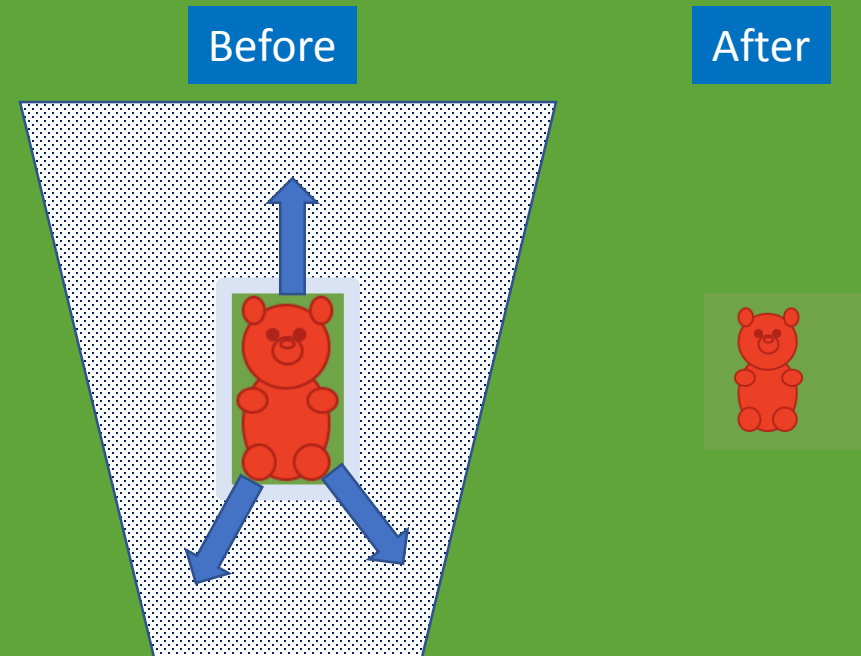
Science behind Growing Gummy Bears

- The gelatin in Gummy Bears is like the cell membrane of cells.
- When the Gummy Bear is placed in water, what happens?
 - Water moves into the gelatin because there are more sugar molecules in the Gummy Bear than in the water.
 - The Gummy Bear grows bigger!



Science behind Shrinking Gummy Bears

- When the Gummy Bear is placed in salt water, what happens?
 - Water moves out of the gelatin because there are more salt molecules in the salt water than in the Gummy Bear.
 - The Gummy Bear grows shrinks!
 - What happens to the Gummy Bears in the other glasses?



Kitchen Experiment

Supplies

- 2 Celery Stalks
- One cup of distilled water
- One cup of salt water

Directions

- Place a stalk of celery in a cup of water.
- Place a stalk of celery in a cup of salt water.
- Let the celery stalk sit in the water and the salt water 12-24 hours.

What happens to the celery in salt water?
What happens to the celery in the distilled water?

Sources

- Gummy Bear Osmosis Lab.
<https://ny24000063.schoolwires.net/cms/lib/NY24000063/Centricity/Domain/208/GummyBearOsmosisLab.pdf>
- Osmosis. <https://kids.kiddle.co/Osmosis>
- <https://www.candywarehouse.com/black-forest-gummy-bears-candy-5lb-bag/>