Bubble Cell Membrane	Grades 9 and 10

Lesson Plan

Description

Use bubbles as a substitute for cell membranes. Their similar molecular structure makes bubbles an easy way to see how cell membranes work to keep the inside and the outside of cells separated, but still allow entrance of certain molecules.

Learning Outcomes

Students will learn about the structure of cell membranes.

Students will learn how membranes can allow certain molecules to enter and other to stay outside of the cell.

Students will learn that organelles also have plasma membranes.

Specific Expectations

Investigate specialized cells in the human body, focusing on different types of cells, and draw labelled biological diagrams to show the cells' structural differences.

Explain the importance of cell division and cell specialization in generating new tissues and organs.

Materials

- Dish soap (Dawn usually works best)
- Water
- Glycerin (optional)
- A straw
- Baking sheet or tray with a rim
    - Alternate: cotton string, two straws (not paper, unless waterproof), roasting pan
- Larger tubes (film canisters or PVC pipe) – optional
- Scissors

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Action

Bubbles, like cell membranes, are flexible and fluid. Bubbles and cell membranes have similar structures. Both are made of double layers of molecules called phospholipids. These molecules have one end attracted to water (hydrophilic) and the other end repelled by water (hydrophobic). Use the bubble solution to show that membranes are fluid and flexible, that organelles are bound by membranes, and that we can create passageways in the membrane.

- Make your bubble solution by mixing water and dish soap at a ratio of 10:1. Add 1 tbsp of glycerin per 4 liters of solution. Let the bubble solution sit overnight for best results.
    - If you choose to use larger tubes, prepare the film canisters by cutting out the bottoms using sharp scissors. You can also use small sections of PVC pipe cut with a PVC cutter or hacksaw. Be sure to get permission and do this with adult supervision. Sand down any rough edges.
- You can pour some bubble solution into your rimmed tray or baking sheet and use a straw to blow bubbles onto the tray.
- Alternatively, you can use the cotton string and two straws to make a bubble frame.
    - Cut a piece of string four time the length of the straws.
    - Thread the two straws onto the string and tie the ends of the string together to make a rectangular frame.
    - Move the knot to inside one of the straws. You can make a handle by cutting another piece of string and threading it through the upper straw.
    - Tie the ends together to make the hanger.
    - Pour the bubble solution into a roasting pan and use the rectangular frame to collect a bubble film.
- Blow some bubbles on the tray and observe the film or observe the bubble film in your frame. Touch the bubble film with a dry finger. Observe and note what happens. Try a few times with dry fingers.
- Blow another bubble on the tray or get the bubble film in your frame. This time touch the bubble film with a finger wet in plain water. Observe and note what happens. Is it different from the dry finger?
- Blow another bubble on the tray or get the bubble film in your frame. Wet your finger in soap solution and touch the bubble. Observe and note what happens when you poke the bubble now. You will see how the film will “repair” itself.
- While using the tray, blow a bubble and then blow smaller bubbles inside the larger bubble. What does this represent? (Organelles inside the cell.)
- Can you use the film canister or PVC pipe to create a hole in the bubble film without it popping? How? What does this represent? (Protein passages.)

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Consolidation/Extension

Try coating your finger with different types of liquids, like vegetable oil and rubbing alcohol and observe the different ways the bubble film reacts.

- Why do you think it is important to be selective about what can and cannot enter the cells?
- How does this relate to how viruses get into the cell?
- Do you know how the mRNA vaccines take advantage of our cell membrane structure to get the mRNA molecules into our cells?
- How is the bubble membrane not like a cell membrane? Describe the differences in their structures.

Accommodations/Modifications

Students can use either a bubble frame or a tray with bubble solution and straws.

Assessment

Have students describe each situation and how the bubble is used to model what is happening in the cell with regards to flexibility, self-repair, passageways, and organelles having their own membranes. Students can use words and diagrams for the comparison.

Additional Resources

Adapted from: https://www.exploratorium.edu/snacks/cellular-soap-opera
https://en.wikipedia.org/wiki/Cell_membrane - phospholipid bilayer

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