A Model Membrane Lab Activity

Objective: Determine how the structure and function of a membrane allows it to perform its functions.

Materials needed: (for a group of 4)

* Tray
* Bubble Solution
* 4 straws
* Straw “contraption”
* Plastic tube
* Toothpick
* Paper clip
* Paper towels
* Piece of thread

Procedure:

1. Fill your tray with a shallow layer of bubble solution (if tray is not already filled)
2. Each person should obtain a straw, keep track of your straw throughout the lab!
3. One by one, take turns making a single large bubble in your trap. (gently blowing into the bubble solution with your straw).
   1. Record your observations of your “membrane” bubble (what does it look like?)-
4. Let everyone in your group make a bubble. Take turns making bubbles for the rest of the lab.
5. Make a fresh bubble. Try dropping a toothpick through the bubble.
   1. What happens??
6. Remove the toothpick and dry it on a paper towel.
7. Make a fresh bubble. Try inserting the plastic tube into your bubble.
   1. What happens??
8. Coat the plastic tube completely with bubble solution. Make a fresh bubble. Insert the coated tube through the bubble.
   1. Record your observations-
9. While the tube is inserted in the membrane, drop a toothpick through the plastic tube.
   1. Record your observations-
10. Move the plastic tube slowly and carefully from side to side, while it is in the bubble. Insert a second solution coated object (such as a straw) into the bubble and move it around also.
    1. Record your observations-
11. Carefully remove the tube and other object from the bubble.
    1. Did anything happen to the bubble? Describe your observations-
12. Using the straw “contraption” submerge it into the bubble solution. Then, slowly pull it up, first from an angle and then vertically, until you have completely removed it from the tray.
13. Holding both handles, gently move the contraption up and down and observe the film (if it pops, form a new one!)
    1. Record your observations of the film-
14. Keep the film in the contraption. Obtain your thread and knot it to form a small circle.
15. Try floating the circle of thread in your film (note: this will take more than one person- hold onto the tail of the thread and just try to float the circle part). Once you have it floating, form an opening in the film by popping the inside of the circle with an unfolded paper clip. \***be patient and gentle and if your film breaks re-do it until you get this!**
    1. Record your observations-
16. Gently remove the thread.
    1. What happened? Record your observations-

Cell Membrane Structure- as from SGI Bio Book page 194

“The cell membrane is made mainly of proteins and phospholipids. The phospholipids form two layers- a bilayer- that gives the membrane both flexibility and strength. You saw this property with the detergent bubbles, which are also made of a type of lipid. The phospholipids in each layer of the cell membrane move from side to side in the cell membrane, trading places with each other and making the membrane a fluid structure.”

Analysis

1. Based on your observations in this lab, what do you think scientists mean when they say that the cell membrane is “fluid”?
2. What did you have to do to make objects pass through the bubble membrane without breaking the bubble?
3. A cell membrane is mostly made of phospholipids. Which would be more likely to be able to move across a cell membrane: a structure made of proteins, or a structure made of proteins coated with phospholipids. Explain, based on the model.
4. The cell membrane can be described as “selectively permeable” or a “selective barrier”. What does this mean?
5. A small break in a cell membrane sometimes closes back up. What properties of the model that you just explored showed how the membrane can reseal itself?
6. In addition to the phospholipid bilayer, cell membranes also have specialized proteins. These proteins are embedded in the membrane, and like the phospholipids, are able to move side to side in the membrane. Some of these proteins function as transporters, allowing other molecules into the cell. Explain how you modeled transport proteins in this lab activity.