Activity: Drawing a Cell Membrane

Lecture Concept
Structure and function of a cell membrane. A good activity for the first day of discussion.

Activity Type
Group work with very simple presentations

Time Needed
50 minutes

Purpose
• To allow the students to evaluate how much they know (and how much they don’t know) about the structure and function of a cell membrane.
• To discover and remedy student misconceptions about membrane structure and function.
• To encourage interaction between students and the pooling of knowledge within a group.

Abstract

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Supplies
- One 16”x26” piece of paper per 3-4 students. A posterboard or flip chart page cut in half works well
- An assortment of sharpies, colored pens, highlighters, crayons or similar supplies
- White Board, markers

Pre-class prep
- Divide the pens/crayons into as many groups as you will need and place them in zip-lock baggies or plastic food containers. Each group needs at least four colors.
- Cut up paper if necessary

In Class
(25 min) Ask the students to put away text books and notes. Have the students divide themselves into groups of 3-4 (or assign groups if you prefer) and move their desks into group circles. While this is going on, pass out a piece of paper and a container of pens to each group. Instruct the groups to draw a picture of a plasma membrane, including as many things as they can think of and labeling everything. **Emphasize that you want only the membrane**, not the whole cell. Walk around the room observing the groups and answering questions until all groups are done.

General Teaching Tip: Teaching During Group Work
While the students are drawing, resist the temptation to “help” them by suggesting things or answering the inevitable “is this right?” questions. Tell them that they must answer these questions for themselves as a group. Reward right answers that group members provide.
(20 min) Have one person from each group come up to the front of the class to hold up their completed drawing. Go down the line of drawings and point out all of the things each group included. Give extra praise (and/or candy) for especially perceptive things like the inclusion of ATP or phosphate on active transporters, specific proteins which were talked about in class (Na/K pump, aquaporin), peripheral membrane proteins, etc. Ask groups to clarify things that are unclear from the drawing. Point out mistakes (kindly) and explain why they are wrong. Answer questions that are engendered by the exercise. Ask if there is anything that was missed by all groups (let them use notes/text for this).

**Things to Ask or Emphasize**
- There is often more than one way to label a molecule. A protein may, with equal truth, be called an aquaporin, a facilitated transport protein, an integral membrane protein, or a transmembrane protein.
- There are many new vocabulary to learn and understand: lipid bilayer, extracellular matrix, etc. Remind the students that now is the time to learn such terms.
- If the students have included cholesterol or saturated/unsaturated phospholipids, ask the class as a whole what they do to the membrane (ie. how they affect membrane fluidity).
- If students have a protein whose function is obvious (at least to you) by the way it is drawn, ask the class what type of protein it is (ie. active transport, passive, facilitated, etc.). This is only useful if the protein is not already labeled as such.
- If the students have included both active and passive transport proteins (and labeled them as such) ask the class in what circumstance one would be used vs. the other.
- If the students have not labeled the inside vs. the outside of the cell, remind them that this is an important distinction.
- If students have included a + on the outside of the cell and a – on the inside, ask the class how that difference came to be (ie. the Na/K pump + leaky K channel).

**Typical Mistakes**
- Phospholipids with only one tail – point out that while these do exist, they aren’t found in plasma membranes.
- Cholesterol that spans the membrane or invades hydrophilic areas – remind the students that cholesterol is hydrophobic and therefore is situated among the phospholipids tails.
- Vague representation of a receptor – few students include one and when they do they often don’t understand what exactly a receptor is. This is a good time to give a brief description of receptors and ligands.
- Cytoskeletal elements on the outside of the cell. Interestingly, no group put ECM on the inside of the cell.

**Comments**
- Keep repeating that they should include everything they can think of, label as much as they can, squeeze every bit of information they can into their drawing.
- If you notice students who are not participating encourage them to do so. If you notice overbearing students who are taking over the group, encourage them to let others have a chance to give suggestions or draw.
• If there are serious participation disparities (which will become apparent early on), consider forming a new group consisting of the non-participators. Often they will participate well in the presence of less aggressive personalities.
• Groups of 5-6 students can work well – their combined knowledge will usually include almost all elements of a cell membrane. However, smaller groups also work well if the students are motivated and relatively knowledgeable. This is especially true with more introverted students, who sometimes are intimidated by a larger group.
• This was a excellent first day (of discussion) exercise because students came out of it relaxed and enthusiastic.