Name_____ Hr _____

Modeling the Cell Membrane

The job of the cell membrane is to both separate the cell from what surrounds it and, most importantly, control what is able to enter and exit the cell. The cell membrane is ***selectively permeable*** meaning that only some things are able to enter and leave the cell easily. ***Passive transport*** happens without the cell needing to use any energy to move things through the membrane. ***Active transport*** needs some energy to move things through the membrane. The cell membrane is made up of ***phospholipids*** where part is hydrophilic (water-loving) and part is hydrophobic (water-repelling). This causes the phospholipids to be arranged in a very specific way with the hydrophobic tails facing inward and the hydrophilic heads facing outwards. In this activity the Q-tips represent the phospholipids. However, one Q-tip equals ***two*** phospholipids (see figure 1).

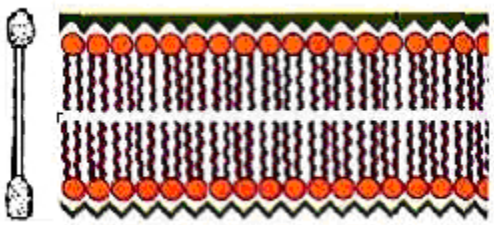

Fig. 1

The membrane also has proteins imbedded in the membrane. Some proteins are simple ***channel proteins*** while others are ***receptor proteins***. There are two types of receptor proteins- an intracellular receptor and an external membrane receptor. The intracellular receptor connects the inside and outside of the cell while the membrane receptor attaches to the outside of the cell. The external membrane receptors bind to a molecule and send a message to the inside of the cell. The entire receptor changes shape and a chain of events follows that tells the cell what to do. There are also carbohydrate ***markers*** on the cell membrane that act to identify the cell.

Lab: Modeling the Cell Membrane

Purpose: How does the cell membrane regulate what moves into and out of the cell?

Materials: 50 Cotton Swabs
1 Rubber Band
2 Pipe Cleaners of different colors
1 Drinking Straw
Scissors

Pre-lab: List the molecules that make up the cell membrane:

Procedure:

1. Gather all the cotton swabs and place into a bundle. Then place the rubber band around the middle of the Q-tip sticks to keep them in this bundle.

2. Place a ***receptor molecule*** into the cell membrane.
    a. Take one of the pipe cleaners and place it through the bundle of cotton swabs. Bend the top end of it into a circular shape. This shape represents how signal molecules bind to specific molecules. Only a circular-shaped molecule can bind with this receptor.

3. Place a ***carbohydrate marker*** into the cell membrane
    a. Use a second pipe cleaner as a carbohydrate chain. Place it in the bundle of cotton swabs, just as in step 2, but don't bend this pipe cleaner.

4. Place ***protein channels*** and ***pumps*** into the cell membrane.
    a. First, cut your drinking straw in half. (This might already be done for you). Then, place both halves into different locations in the bundle of cotton swabs.

Questions:

1. Draw your model here.

    What does the drinking straw represent?

2. How do the swabs represent the polar and non-polar characteristics of the cell membrane? Which part is hydrophobic and which part is hydrophilic?

3. In this model, the swabs and proteins can be moved around. Explain whether this is an accurate representation of actual cell membranes.