

5: MEMBRANES (part 1)

If you could throw a whole bunch of phospholipid molecules into a bucket of water, the water-hating tails would go into a panic and try to find a way to get away from the water molecules. The tails would all congregate together, to make an area that was water-free. More and more molecules would join in until a sphere had formed. A sphere is the most efficient, compact shape they could form. A simple, single-layer sphere of phospholipids is called a **micelle**. We will see these in a future lesson. (A micelle is shown and discussed in the video lesson, but not drawn as part of this lesson.)

Another way the phospholipids could arrange themselves is into a double layer, with all the tails turned inward. A double layer of phospholipid molecules is called a **phospholipid bilayer**. This term is used quite frequently in cell biology. The phospholipid bilayer is the basic structure of a cell membrane. It separates the inside from the outside. Most cell organelles are also surrounded by a phospholipid bilayer.

A simple phospholipid sphere can be called a **liposome**. “Lipo” is Greek for “fat,” and “soma” is Greek for “body.” We will look at three cell parts that have the structure of a liposome.

An empty liposome can be called a **vacuole**. “Vacuus” is Latin for “empty.” Vacuoles can contain water or air.

A **vesicle** is basically a vacuole that has stuff inside of it. Cells use vesicles like we use plastic or paper bags. Anything that needs to be stored, or transported across the cell, can be put into a vesicle “bag.” Sometimes vesicles filled with certain substances (food, fats, chemicals) are given fancy names, rather than just being called a vesicle. We’ll see some of these in future lessons.

A **lysosome** is a very special kind of liposome. It contains digestive enzymes, so it is a bit like a stomach. Things that need to be broken down and recycled (old cell parts, or even bacteria) are put into a lysosome. The digestive enzymes are able to tear them apart and turn them into simple proteins, sugars, and other molecules that cells can use. It’s like destroying a Lego sculpture and using the parts to build something else. The word “lys” means “to dissolve or break apart.” Lysosomes can contain as many as 50 different kinds of enzymes. Each enzyme does only one job.

Scientists used to think that if a lysosome burst, the cell would die because the enzymes would get out and go around digesting all the cell parts. (Enzymes are not smart. They don’t know what they are supposed to digest. They digest anything in their path.) Then they discovered that the environment inside a lysosome prevents this from happening. The digestive enzymes need an acidic environment to be able to function. Little proton pumps in the membrane of the lysosome bring protons inside. An environment with lots of protons floating around will be acidic. When the lysosome bursts, the enzymes do escape, but they suddenly find themselves in an environment that is neutral, not acidic. Therefore they stop functioning (or at least slow way down).

NOTE: Lysosomes do participate in cell death (apoptosis or necrosis, which we will discuss in future lessons) and are sometimes “given instructions” to digest cell parts, but under normal circumstances lysosomes don’t endanger their cells.