TITLE:
Cell Structure and DNA

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DCPS STANDARDS:

7.4.10 Describe the differences between unicellular and multicellular organisms.

7.4.2 Explain the structure and function of the four types of macromolecules.

7.5.1 Describe the structure and function of DNA.

GOALS:

Activity One:

1. Scholars will understand the function of the phospholipid bi-layer
2. Scholars will visualize the breakdown of a lipid by an emulsifying agent

Activity Two:
1. Scholars will see a demonstration of DNA extraction
2. Scholars will visualize DNA from a polyploidal fruit (strawberries)

OBJECTIVES:

Activity One:
1. Scholars will describe the function of the phospholipids bi-layer
2. Scholars will predict what will happen to the lipid bi-layer if an emulsifying agent is added.
3. Scholars will recall that a lipid bi-layer encloses both the cell and the internal organelles

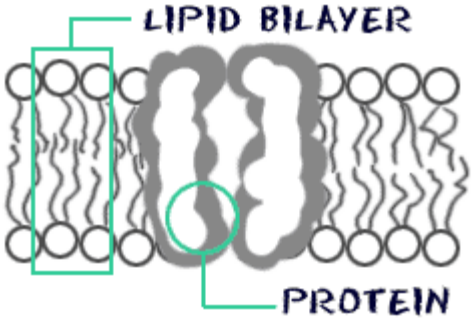
Activity Two:
1. Scholars will observe DNA extracted from a strawberry
2. Scholars will list the purpose of each of the added ingredients

INTRODUCTION: (GLOBAL PREREQUISITE KNOWLEDGE)

Provided by: http://www.biology4kids.com/files/cell_nucleus.html

Cell Membranes

We have been talking about cells being a unit of organization in biology. Let's look at the **cell membrane** and see how that membrane keeps all of the pieces inside. When you think about a membrane, imagine it is like a big **plastic bag with some tiny holes**. That bag holds all of the cell pieces and fluids inside the cell and keeps any nasty things outside the cell. The holes are there to let some things move in and out of the cell.



Flexible Containers

The cell membrane is not one solid piece. Everything in life is made of smaller pieces and a membrane is no different. Compounds called **proteins** and **phospholipids** make up most of the cell membrane. The phospholipids make the basic bag. The proteins are found around the holes and help move molecules in and out of the cell.

Scientists describe the organization of the phospholipids and proteins with the **fluid mosaic model**. That model shows that the phospholipids are in a shape like a head and a tail. The heads like water (**hydrophilic**) and the tails do not like water (**hydrophobic**). The tails bump up against each other and the heads are out facing the watery area surrounding the cell. The two layers of cells are called the bilayer.

Ingrained in the Membrane

What about the membrane proteins? Scientists have shown that the proteins float in that bilayer. Some of them are found on the inside of the cell and some on the outside. Other proteins cross the bilayer with one end outside of the cell and one end inside. Those proteins that cross the layer are very important in the active transport of ions and small molecules.

Many Membranes

As you learn more about the organelles inside of the cell, you will find that most have a membrane. They do not have the same chemical makeup as the cell membrane. Each membrane is unique to the **organelle**. The membrane that surrounds a lysosome is different from the membrane around the endoplasmic reticulum. They are both different from the cell membrane.

Some organelles have two membranes. A mitochondrion has an outer and inner membrane. The outer membrane contains the mitochondrion parts. The inner molecule holds digestive enzymes that break down food. While we talk about membranes all the time, you should remember they all use a basic phospholipid bilayer, but have many other different parts.

Cell Nucleus - Commanding the Cell

The cell nucleus acts like the brain of the cell. It helps control eating, movement, and reproduction. If it happens in a cell, chances are the **nucleus** knows about it. The nucleus is not always in the center of the cell. It will be a big dark spot somewhere in the middle of all of the cytoplasm (cytosol). You probably won't find it near the edge of a cell because that might be a dangerous place for the nucleus to be. If you don't remember, the cytoplasm is the fluid that fills cells.

Life Before a Nucleus

Not all cells have a nucleus. Biology breaks cell types into eukaryotic (those with a defined nucleus) and prokaryotic (those with no defined nucleus). You may have heard of chromatin and DNA. You don't need a nucleus to have DNA. If you don't have a defined nucleus, your DNA is probably floating around the cell in a region called the **nucleoid**. A defined nucleus that holds the genetic code is an advanced feature in a cell.

Important Materials in the Envelope

The things that make a eukaryotic cell are a defined nucleus and other organelles. The nuclear envelope

surrounds the nucleus and all of its contents. The nuclear envelope is a membrane similar to the cell membrane around the whole cell. There are pores and spaces for RNA and proteins to pass through while the nuclear envelope keeps all of the chromatin and nucleolus inside.

ESSENTIAL QUESTIONS:

- Activity One: What is the purpose of a lipid bi-layer around our cells?
- Activity Two: How can we get DNA out of a cell?

GLOBAL RATIONALE:

The phospholipid bi-layer plays an important role in all animal cells. It plays an important role in the homeostasis of the cell. It also regulates what is allowed to enter and exit the cell and its organelles. Proper function of the lipid layer protects from many diseases that deal with an inability of the cell to maintain homeostasis. DNA is the genetic material that can survive long after it is removed from the cell. It is important for students to understand the function of cells in the body and their contribution to everyday function.

RESEARCH ACTIVITIES:

- **Activity One: Breaking Down Lipids**
- **Activity Two: Extracting DNA**

GLOBAL EVALUATION AND ASSESMENT:

- Students should explain the purpose of a phospholipid bi-layer
- Students should know that DNA is located in the nucleus.
- Students should explain how DNA can be extracted from a cell.