TITLE:

Extracting DNA

PREPAREDBY:

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DCPS STANDARDS:

7.4.3 Explain that in those cells that contain a nucleus (eukaryotic plant and animal cells), the nucleus is the main repository for genetic information

7.4.4 Explain that prokaryotic cells differ from eukaryotic cells most prominently in that they don't have a membrane-bound nucleus. Know their genetic information is in a threadlike mass, often a very long loop of DNA.

GOALS:

1. Scholars will see a demonstration of DNA extraction

2. Scholars will visualize DNA from a polyploidal fruit (strawberries)

   And where DNA is located and its purpose.

OBJECTIVES:

1. Scholars will participate and observe DNA extracted from a strawberry

2. Scholars will list the purpose of each of the added ingredients

PREREQUISITE KNOWLEDGE:

It is important that students understand that DNA is located in a defined nucleus in higher cell organisms. They should know that the nucleus is protected by a protein lipid bi-layer, that, when broken down with shampoo or soap, will allow all the contents of the nucleus to be spilled into solution. Students should know that DNA is soluble in the mixing solution, but becomes insoluble when alcohol is added. It is not necessary that they understand the biochemistry associated with this matter. The background information was obtained from http://www.biology4kids.com/files/cell_nucleus.html.

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:

1. What keeps DNA inside of the nucleus? Inside of the cell?
2. How can we get DNA out of a cell?
3. How can DNA be seen?
4. Where DNA is located and its purpose?

LABORATORY MATERIALS:

1. 1 heavy duty zip-lock baggie
2. 1 strawberry (fresh or frozen and thawed)
3. cheesecloth
4. funnel
5. 100 ml beaker
6. test tube
7. wooden coffee stirrer

Reagents:

1. DNA extraction buffer (One liter: mix 100 ml of shampoo (without conditioner), 15 g NaCl, 900 ml water **OR** 50 ml liquid dishwashing detergent, 15 g NaCl and 950 ml water)
2. Ice-cold 95% ethanol or 95% isopropyl alcohol

ACTIVITY

1. Place one strawberry in a zip lock baggie.

2. Smash strawberry with fist for 2 minutes.
3. Add 10 ml extraction buffer to the bag.
4. Mush again for one minute.
5. Filter through cheesecloth in a funnel into beaker.
6. Pour filtrate into test tube so that it is 1/8 full.
7. Slowly pour the ice-cold alcohol into the tube until the tube is half full.
8. At the interface, you will see the DNA precipitate out of solution and float to the top. You may spool the DNA on your glass rod or pipette tip.

Activity Procedure and materials provided by:
http://www.ncsu.edu/kenanfellows/2002/pligon/biotech/labs/strawberry.html

DIFFERENTIATING INSTRUCTION:

English Language Limited students should have no problems with this activity as it will be an observation.

RATIONALE:

Students know that they have DNA, but they aren't sure of it because they've never seen it. Allowing visualization of DNA helps students to conceptualize other molecules that may not be able to be seen. This will help greatly in future studies in biology, microbiology, chemistry, and other life and physical sciences.

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.