

Activity 1.2.2: DNA Extraction

Introduction

DNA is the fundamental building block for life. It resides in the nucleus of cells and consists of thousands of *genes* that contain the instructions for building the different parts of the cell. DNA is what makes us who we are. It determines what physical characteristics we have, such as hair and eye color, as well as some of the diseases we may develop. DNA is a very long molecule, so in order to fit inside the cell, the DNA is highly coiled and twisted into *chromosomes*.

A cell is a complex living unit that contains many biological molecules and organelles, each performing a specific function within the cell. In order to analyze the DNA found at a crime scene, the DNA needs to first be extracted from the cells. This means that it must be separated from all of the other chemicals and materials inside the cell.

Equipment

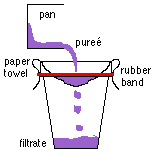
* Computer with Internet access
* Laboratory journal
* Inspiration® Resource Guide
* 95% Alcohol (kept ice cold)
* DNA extraction buffer
* (2) 8cm Squares of cheesecloth
* Distilled water
* Cups of crushed ice
* Strawberries or bananas
* Ziploc freezer bags (small, quart size)
* Small paper or plastic cups (e.g., bathroom cups)
* 15 mL Screw-cap conical bottom plastic centrifuge tubes
* Plastic transfer pipettes
* Glass stirring rod or wooden popsicle stick
* Knife

Procedure

In this lab you will isolate DNA from plant cells. In order to extract DNA from cells, scientists take advantage of the unique chemical properties of the DNA. Plant cell walls are made of cellulose, which is a tough, insoluble material that makes plants sturdy. It can be broken through physical actions. In this lab you will mash the strawberries in order to break open the cell walls. Cell membranes and nuclear membranes are made up of fats. Detergents wash away these fats, just like they would grease in a pan. In this lab you will treat the mashed strawberry cells with detergent to dissolve the cell membranes and nuclear membranes to release the DNA. Once the cells are broken open, the DNA and cell debris are all mixed together. Because the DNA is in solution, you can separate the components by filtering the mixture through cheesecloth. Finally, you can separate the DNA from solution with alcohol, since DNA does not dissolve in alcohol. It is very important that you follow the procedure carefully. Otherwise, your DNA sample will be contaminated with proteins and other cell components. Remember to follow all the safety instructions provided by your teacher.

*DNA Isolation from Fruit:*

1. Put on the appropriate personal protective equipment, including safety gloves and goggles. Tie back any loose hair.
2. Gather the following materials from your teacher. Many items may be located at your station.
   * 95% Alcohol (kept ice cold)
   * DNA extraction buffer
   * 8cm Squares of cheesecloth (2)
   * Distilled water
   * Cups of crushed ice
   * Strawberry
   * Sealable freezer bags (small, quart size)
   * Paper or plastic cup
   * 15 mL Screw-cap conical bottom plastic centrifuge tube
   * Plastic transfer pipette
   * Glass stirring rod or wooden popsicle stick
   * Knife
3. Cut the stem off of the strawberry and place into the sealable freezer bag. Make sure all of the air is out of the bag and mash the strawberry very well. Do not smash the strawberry or the bag will break.
4. Pour 15 mL of DNA extraction buffer into the bag. Seal the bag and mush together for one minute.
5. Place the square of cheesecloth over a small paper or plastic cup. Make sure to create a pocket deep enough to hold the mixture and cover the rim of the cup. Secure with a rubber band if needed.



1. Pour the strawberry mixture slowly into the filter. Make sure NOT to overfill. Pour in only as much as needed to fill the filter at one time.
2. Once the mixture has filtered through, carefully pour 2 mL of the filtered contents into a clean 15 mL conical tube.
3. Hold the 15 mL conical tube at an angle. Using a transfer pipet, carefully and slowly add 5 mL of cold 95% ethanol down the side of the tube. The mixture will sink to the bottom of the tube and alcohol will sit on top. Do NOT mix. Allow the tube to sit undisturbed for two or three minutes.
4. Watch closely as the DNA will appear as a clear-to-whitish, stringy clump where the ethanol layer meets the strawberry extract layer. Tiny bubbles in the ethanol layer will appear where the DNA precipitates.
5. Dip the glass stirring rod or wooden popsicle stick into the tube and twirl it around gently to collect some DNA. Stir the DNA gently at the interface between the ethanol and strawberry extract layer to extract more fibers.
6. Carefully remove the stirring rod or popsicle stick from the tube and observe the DNA. Record all observations in your laboratory journal.

\*Take a Picture of your DNA for your weebly!!

Conclusion

1. What physical evidence obtained from the crime scene could be used to obtain DNA?
2. Describe one of the main challenges in extracting DNA from cells found at a crime scene.