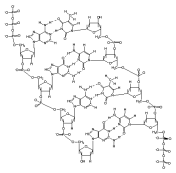
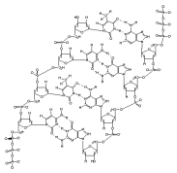


2A. Extracting DNA from Human Cheek Cells



Introduction

Can DNA be found in human eukaryotic cells? DNA, a polar molecule composed of two complementary chains of nucleotides wound in a double helix, is present in all living things from bacteria to plants to animals. In animals, it is found in almost all cell types: muscle fibers, reproductive cells, white blood cells, and skin cells. The basic procedure for extracting DNA is the same, regardless of its source, although the specifics may vary:

- **Collect** the cells containing DNA
- **Break** the cellular membranes to release the DNA
- **Separate** the cellular components from the DNA
- **Precipitate** the molecules of DNA

Remember the basic technique?
Detergent e**N**zyme **A**lcohol

Extracting DNA is a simple process. The activity begins by collecting cheek cells by rinsing the mouth with distilled water and gently scraping the oral cavity with the teeth and tongue. This process will help gather numerous epithelial cells lining the oral cavity. The DNA Extraction Buffer (DEB) solution (containing detergent, enzyme, and salt) is then added to the cheek cell solution and mixed thoroughly in order to split or break the cells open. This process releases the DNA from inside the cells and nuclei because the detergent breaks apart the lipid components that make up cellular and nuclear membranes. The enzyme assists in separating the DNA from the proteins (histone) associated with it, while the salt changes the polarity of the solution and helps to keep the undesirable components separate from the DNA. This process will allow DNA, a polar or slightly negatively charged molecule by nature when released from nuclei, to dissolve in the ionic solution while many fats, carbohydrates and proteins settle out. Finally, the DNA is then precipitated from the ionic solution by the adding cold 90% ethanol. This process will allow DNA, which is not soluble in the alcohol, and the alcohol, which are less dense than the ionic solution, to appear towards the top of the solution.

PURPOSE: How will the DNA extracted from human epithelial cells compare to the DNA extracted from strawberries?

HYPOTHESIS: (How you perceive the DNA product of this extraction will be similar to or different from the strawberry DNA product. i.e. – amount collected, color, structural appearance, etc.)

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MATERIALS:

- 1 Human cell donor per team
- Distilled water
- DEB solution
- Cold ethanol (90%)
- drinking cup
- graduated cylinder
- test tubes and rack
- inoculating loop
- Eyewear: WILL BE WORN throughout the lab!

PROCEDURE:

1. Clean your /partner's mouth of any residual food items by rinsing your mouth with water prior to the next step.
2. "Measure" (listen for directions) 10 mL of the distilled water into a paper cup. Swirl the water in your mouth for about 3-4 minutes; it would help greatly if you also firmly, yet gently scraped the inside of mouth with your teeth, and used your tongue to agitate the mixture to insure a high cell count.
3. Carefully deposit the "mouthwash" solution back into the paper cup. Carefully pour 10 mL of the "mouthwash" solution into a test tube and set aside.
4. Add 5 mL of the DEB solution to the test tube.
5. Cover the top of the test tube with your thumb, gently mix the contents by turning the test tube upside down and right side up about 5 times – try to avoid foaming the mixture if at all possible. Allow to settle for about 3 min.
6. Tilt the test tube and slowly drizzle cold ethanol to form the DNA precipitation interface.
7. Place the test tube in rack and observe for 3-5 minutes as the DNA precipitates and floats to the surface.
8. If you wish, spool the DNA strands at the top and interface and remove from ethanol using the inoculating loop.
9. Clean-up: thoroughly rinse all glassware, test tube and cup contents may be disposed of in the sink. Dispose of cup in the trash. Return eyewear to sterilizer. Wipe down and organize station. Work on conclusion.

OBSERVATIONS/DATA:

CONCLUSION: ***This will be used to assess your mastery of 2A on the Map2Mastery!***

On your own paper write a conclusion summarizing what you have learned from the DNA Extraction lab experiences. Suggested elements to include (not necessarily in this order):

- an evaluation of today's hypotheses
- probable reasons or factors which might explain differences or similarities noted in the products of the extraction labs
- overall appearance of the DNA product and why it appears that way (if not already discussed above)
- brief summary of the steps/materials used to extract DNA and "how/why" they are necessary to the extraction procedure
- an assessment of the technique itself – in what ways is this procedure effective, in what ways might it be improved?
- What applications could be utilized by being able to extract DNA for human cells in today's society? In other words – what is the usefulness of being able to extract DNA?

Two pages (double spaced) should be about right for the length of the conclusion. Write efficiently and simply, but be sure to use the proper terminology correctly.