



DNA Extraction Using Human Cheek Cells



Purpose: To isolate DNA from human cheek cells.

Chemicals: Sodium chloride solution
Sodium lauryl sulfate solution or dishwashing detergent
Ethyl alcohol
Meat tenderizer solution

*****This lab requires the use of hazardous components and/or has the potential for hazardous reactions. Ethyl alcohol is flammable and a dangerous fire risk: keep from flame and all sources of ignition. WEAR SAFETY GOGGLES!*****

Procedure:

1. Add 1 mL (20 drops) of the sodium chloride solution to the large test tube. Set the tube in the test tube rack.
2. Pour 5 mL of tap water into a clean plastic cup.
3. Gently chew the insides of your cheeks for 30 seconds. **DO NOT DRAW BLOOD!**
4. Put the 5 mL of water in your mouth and swirl it around for at least 30 seconds. Use your tongue to loosen the cells. Spit the water back into the cup.
5. Pour the cheek cell water into the test tube containing the salt solution from step 1.
6. Add 1 mL (20 drops) of the dishwashing detergent solution to the cheek mixture in the test tube.
7. Stopper the test tube and mix the contents of the tube by **gently** inverting the test tube 5 times. **DO NOT SHAKE THE TEST TUBE!** (The detergent will remove the cell membranes from the cheek cells, releasing the DNA into the salt solution.)
8. Record observations and changes on your lab sheet.
9. Add 10 drops of the meat tenderizer solution to the test tube. Stopper the tube and gently invert the tube a few times. (The meat tenderizer solution is added to destroy nuclear proteins that bind DNA and to destroy the enzymes that break down the DNA.)
10. Place your test tube in the warm water bath and incubate it at 50 degrees Celsius for 10 minutes. Then remove your test tube. The warm water denatures enzymes that might damage the DNA. **While you are waiting, work on the lab questions.**

Turn Over!

Precipitate the DNA

11. Holding the test tube at a 45 degree angle, carefully pour 5 mL (100 drops) of ethyl alcohol down the side of the test tube so that it forms a layer over the cheek mixture in the test tube. *Ice cold alcohol gives better results.*
12. Stopper the test tube and put it in the test tube rack. Let it stand undisturbed for 5 minutes and observe what happens at the interface between the ethyl alcohol and the cheek solution. (The clouds of white strands are DNA. The DNA is not soluble in the ethyl alcohol so it precipitates where the two liquids meet. Bubbles from the cheek solution get trapped in the DNA strands and lift the DNA out of solution.)
Note: Sometimes it is necessary to stopper the test tube and very gently tilt the tube on its side and then turn it upright several times until the water and alcohol phases have mixed and the DNA comes out of solution.
13. Record observations and changes on your lab sheet.

OPTIONAL: Listen to your teacher's instructions before completing the next steps.

Collect the DNA

14. Add 1 mL (20 drops) of ethyl alcohol to the smaller test tube.
15. Place a clean glass stirring rod in the test tube containing the DNA. Collect the DNA by winding it on the rod by turning the rod in one direction.
16. Carefully remove the rod and the DNA from the solution and transfer it to the smaller test tube containing the 1 mL of ethyl alcohol. Observe the DNA strands floating in the alcohol.
17. Clean all lab equipment and your station. Go to your desk and answer the post-lab questions.

LAB: DNA Extraction Using Human Cheek Cells

Pre-Lab: The entire pre-lab section must be completed prior to lab day in order to complete the lab with the rest of the class. Use the lab sheet posted on the classroom website to answer the pre-lab questions. (Or see Mrs. Smith before/after school to use her copy.) USE COMPLETE SENTENCES TO ANSWER THE PRE-LAB QUESTIONS.

1. What is the purpose of this lab?
2. Why should you wear goggles during this lab? Be specific.
3. From what type of cells will you be extracting DNA?
4. In step #6, you are asked to add 1 mL of dishwashing detergent to your mixture. What is the purpose of doing this?
5. In step #9, you are asked to add meat tenderizer to your mixture. What is the purpose of doing this?
6. In step #10, you are asked to incubate your mixture in a warm water bath. What is the purpose of doing this?
7. What chemical is used to dehydrate and precipitate the DNA, ultimately making it visible to you?

LAB Analysis & Conclusions: Answer all of the following questions below using COMPLETE SENTENCES while you are completing the lab procedure.

1. Record observations from step 8:
2. Record observations from step 13:
3. Where is the DNA located in a cell?
4. What two membranes have to be broken before the DNA is released?

5. ***Thoroughly*** describe the structure of the cell membrane. (Use page 204-205 of your text to help you.)

6. Think about when you wash fat and other food off of your dishes. Is the water alone effective in washing greasy dishes? _____ What do you add to break up or “emulsify” the fats? _____

7. The _____ removes the membranes from the cheek cells, releasing the _____ into the salt solution.

8. Think back to polar (water loving) and non-polar (water hating) substances. Remember, polar substances, like water, dissolve in other polar substances. And non-polar substances, like alcohol, dissolve in other non-polar substances. Which would be better to dissolve fats (lipids), water or alcohol? _____ Explain.

9. What two substances make up a chromosome?

10. What are the building blocks of proteins?

11. Is DNA soluble in ethyl alcohol? How do you know?

12. The alcohol dehydrates and precipitates the DNA, so strands of DNA will form at the interface between the _____ and the cheek solution.

13. Based on the lab results, what do you think the word precipitate means?

14. What did you learn in this lab?

15. Describe two possible sources of error and how they could have affected your lab results.

16. Do you think you are turning in a lab of excellent quality? Explain.