

Human Cheek Cell DNA Extraction

Introduction¹

DNA – the seemingly mysterious substance that holds the secrets of life, turns out to be a relatively simple chemical polymer made of repeating patterns of A's, T's, C's, & G's (representing the chemicals Adenine, Thymine, Cytosine, & Guanine). How can something so simple be the very stuff of life itself, the instruction booklet for life, a how-to guide for building a living thing? In the course of the next few weeks we will uncover the basic process by which DNA gets things done. In the meantime, this lab will further de-mystify DNA by allowing you to see it for your own eyes as a rather abundant substance found in virtually all of your body's cells.

How it works: The cell itself and the nucleus within the cell are both surrounded by membranes made primarily of phospholipids. Soapy water, by emulsifying (look it up) lipids in water, destroys the membranes and thereby exposes the contents of the cell & nucleus, including the DNA.

Gatorade helps remove cells from your cheeks and also makes the watery solution denser – this increased density will facilitate the separation of the DNA strands into the alcohol.

Alcohol is less dense than water so it floats on top of the water. Most of the cellular components are “heavy” (dense) enough to remain in the watery solution at the bottom of the test tube. DNA, however, is less dense than either the water or the alcohol, so it floats to the surface of the alcohol. DNA is also soluble in water but “precipitates” (separates, more or less) in alcohol.

DNA is exceedingly thin (0.000002 mm!) but clumps together. This is similar to the idea that cells are microscopically small (invisible to the naked eye) but “clumped” together in a multi-cellular organism, are quite visible without the need for a microscope.

Purpose

To use a *protocol* for extracting DNA from cheek cells

To observe a collection of DNA strands

Materials

30 mL (about 1 oz) Gatorade

5 mL Soap Solution (25%)

30 mL Cold Alcohol

Test Tube

Plastic/paper cup

Safety/Precautions

Do not handle anyone's materials except your own.

Immediately dispose of paper cups

Do not ingest (eat or drink) any materials used in this lab except Gatorade supplied.

Procedures

This extraction works best if students have not just recently eaten or chewed gum.

1. Add 5mL of the soap solution to a test tube.
2. **Violently** swish the saltwater in mouth (do not swallow) for 30 seconds, making sure to rub tongue along cheeks.
3. Carefully spit the water mixture back into the plastic cup.
4. Pour spit into a test tube until is about half full.
5. Place the cap back on the test tube, **gently** rocking the tube back and forth for 1-2 minutes. (Make sure to place one finger on the lid, with another holding the bottom of the tube preventing the lid from coming off.)
6. Add enough **Cold**, ethyl alcohol, to almost fill the test tube **After This DO NOT tip, shake, or mix the Test Tube or you may not see DNA**
7. If you look to the line of separation between the layer of water and the layer of alcohol (the **interface**) you will start to see bubbles attached with tiny hair like white strings rising through the alcohol. These strings are your DNA.

Analysis Questions

1. What is DNA?

2. What does your sample of DNA look like?

3. Why doesn't your DNA look like the double helix we see in textbooks?

4. Where is DNA Found?

5. What is the role of soapy water in the DNA extraction lab?

6. **Draw** & **label** a picture of your test tube with DNA.

