Name: Nini Erk Period: Gr.8 per1 Date: June. 07. 2011

Human Cheek Cell DNA Extraction

Introduction[1]

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 ***A***denine, ***T***hymine, ***C***ytosine, & ***G***uanine). 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 again the nucleus within the cell are both surrounded by membranes made primarily of phospholipids. Detergent, by emulsifying lipids in water, destroys the membranes and thereby exposes the contents of the cell & nucleus, including the DNA.

Saltwater 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 (0.0000002 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 1oz) 1% Salt Solution
5 mL Soap Solution (25%)
30 mL Cold Ethyl Alcohol
Test Tube with Lid
Plastic cup
Wooden stir rod

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 water 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. V**iolently** 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.

Adapted from: Heather Johnston (via middleschoolscience: Yahoo Group) and various other sources.

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Analysis Questions

1. What is DNA?

* Within the cell, a seemingly mysterious substance found in nearly all-living organisms, in the nucleus is DNA, known as the genetic material. In the cell, the DNA or genetic material gives information and all the instructions to make a new cell. Most of the time, the genetic material takes the form of long, very thin threads, which are difficult to see. But when the cell divides to make new cells, the long threads coil up and shorten to form chromosomes which are easy to see under the microscope.
* The DNA structure consists of two strands coiled around each other to form a double helix, a structure like a spiral ladder. Each rung of the ladder consists of a pair of chemical groups called bases. These bases are: Adenine, Thymine, Cytosine, and Guanine and are used in repeating patterns of A's, T's, C's, and G's.

2. What does your DNA "look" like?

* Once the DNA is released, the DNA from the broken open cells intertwines with DNA released from other cells. Eventually, enough DNA intertwines to become visible to the human eye as whitish strands (this was seen in this lab). These strands seem thin to the human eye but they are actually even thinner. If the DNA clump was unraveled and stretched out, then the very strand would be 0.0000002mm thin. To see this strand a microscope would have to be used to magnify such a tiny strand.

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

* The DNA seen does not look like a double helix (a ladder shaped structure) because the human eye cannot see to that extent. To see such a structure a microscope or other equipment would be needed to further magnify it. However, the DNA strands are still in a double helix structure, just not visible.

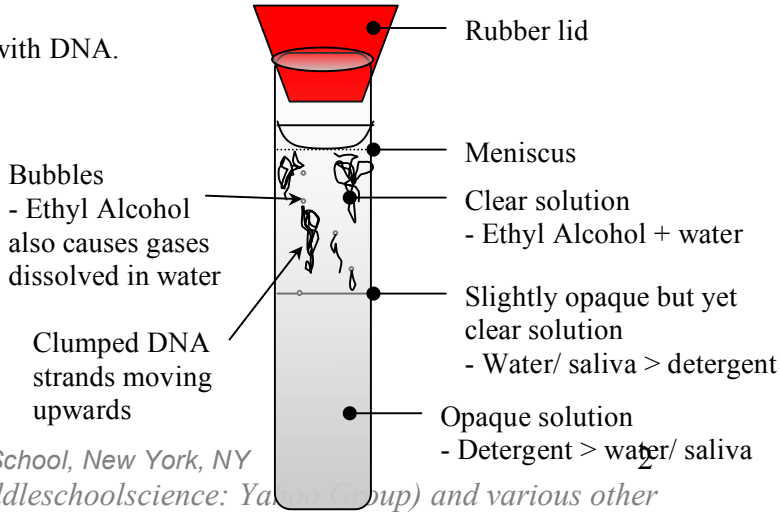
4. Where is DNA Found?

* DNA is found nearly in all-living organisms, in the nucleus of the cell protected by membranes composed of phospholipids.

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

* The detergent in this lab is primarily used to release and expose the contents of the cell and nucleus therefore, the DNA. What the detergent does is that it emulsifies the lipids of the cell membrane in the water, which thereby destroys the membranes and exposes the contents of the cell, DNA.

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



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See also the following resources for DNA extraction:
How to extract DNA from Anything: http://learn.genetics.utah.edu/units/activities/extraction/
Nova: Cracking the Code of Life: http://www.pbs.org/wgbh/nova/teachers/activities/2809_genome.html
Access Excellence (Advanced): http://www.accessexcellence.org/AE/AEC/CC/DNA_extractions.html

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