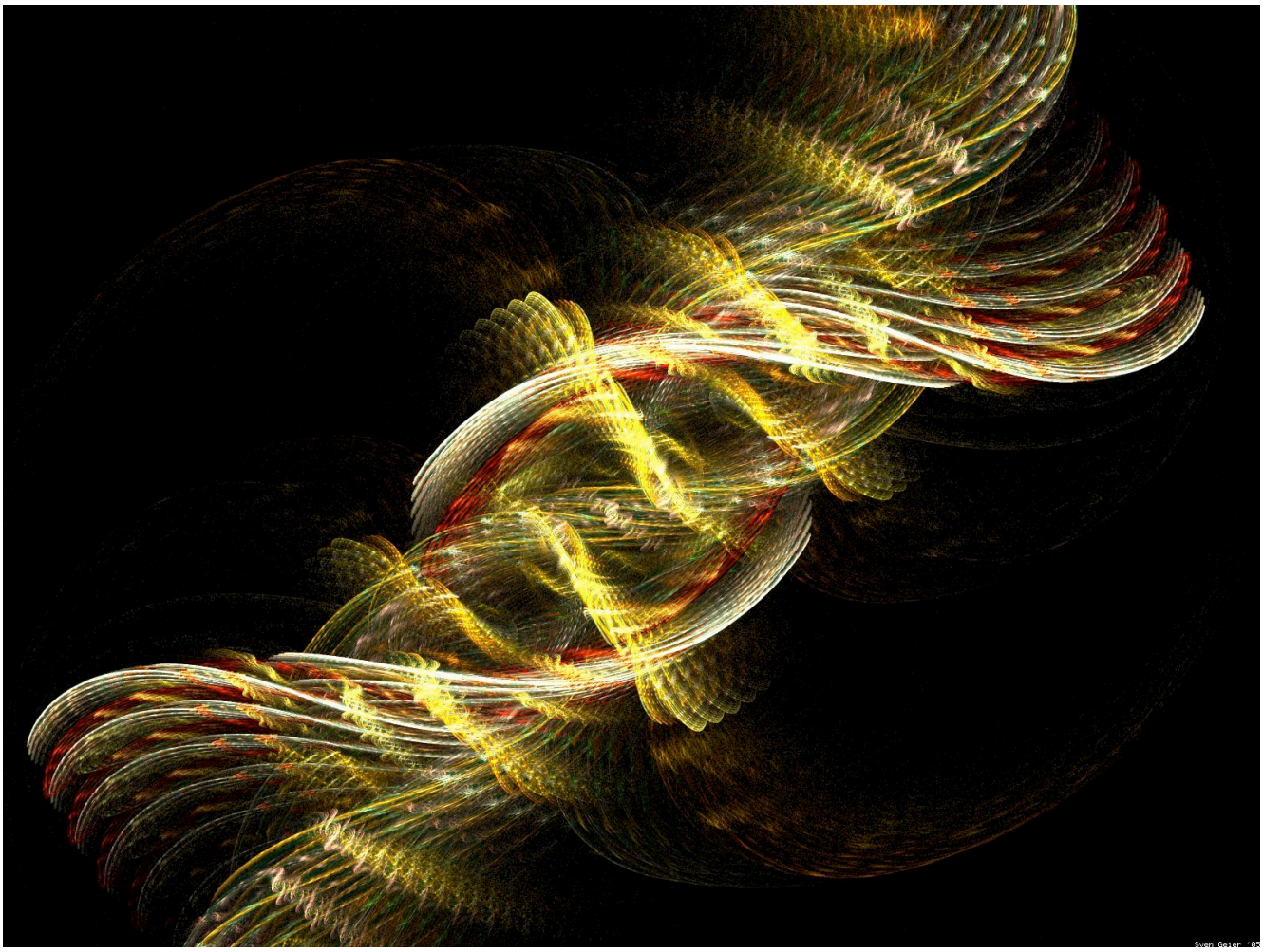
Lab Report

Name: Joe

Lab Partner: Joey & Graham

Science Lab Report • MCS Adolescents • May 30, 2022



INTRODUCTION:

“Look at yourself in a mirror and reflect upon the fact that you are beholding ten thousand trillion cells, and that almost every one of them holds two yards of densely compacted DNA, and you begin to appreciate just how much of this stuff you carry around with you…Yet DNA is not alive.” – Bill Bryson

DNA, deoxyribonucleic acid, provides the blueprint for the assembly of proteins and is ultimately responsible for directing the structure and function of all cells. It is passed on from generation to generation. In this lab you will collect some cells, break the cells and nuclei open (lyse) to release the DNA, and concentrate (precipitate) the DNA so that you can see it.

PURPOSE: To understand how DNA can be extracted from cells.

HYPOTHESIS:

I hypothesize that DNA is extracted from cells by breaking the cell and opening the nuclei to release the DNA. Once that is done you must concentrate it so that it is large enough to see.

MATERIALS & EQUIPMENT:

- ❑ 92 ml distilled water
- ❑ 8g salt
- ❑ Cold 91% Isopropyl Alcohol
- ❑ Detergent solution
- ❑ 2 Pipettes
- ❑ 2 Test tubes
- ❑ 2 Test tube stoppers
- ❑ 2 30 ml Cups

- ❑ 2 Wooden stirring rods
- ❑ Safety glasses
- ❑ Gloves
- ❑ Watch or stopwatch

PROCEDURE:

1. Prepare an 8% salt solution by adding 8g of salt to 92ml of water. Be sure to dissolve the salt completely in the water by stirring it with a wooden stirring rod.

The remaining steps in the procedure will be carried out by each student individually.

2. Fill a cup with 30ml of the salt solution.
3. Take the salt water and violently swish it in your mouth, making sure to rub your tongue along your cheeks. DO NOT SWALLOW. Do this for 30 seconds before spitting the water back in the cup.
4. Fill a test tube half way with the water from the cup.
5. Carefully add ten drops of soap solution using a pipette.
6. Place the stopper on the test tube and rock it gently back and forth for one or two minutes.
7. Add enough cold alcohol to almost fill the test tube by dripping the alcohol gently down the wall of the test tube using a pipette. DO NOT TIP, SHAKE, OR MIX THE TEST TUBE.
8. Watch the line of separation between the alcohol and the water. You will start to see bubbles attached with tiny hair-like white strings. This is your DNA. Draw what you see.
9. Using a wooden stirring rod, spool the DNA by slowly twisting the stirring rod as you lift it out of the test tube.

DATA TABLES & OBSERVATIONS:

After I added the alcohol into the test tube, the line between the alcohol and the water was very define. The alcohol is remaining clear, but the water is becoming very cloudy. I can now see very tiny white strings floating in the water, and are rising toward the alcohol, but stop at the separation line.

Test Tube Illustration

DATA ANALYSIS & RESULTS:

The Human Genome Project begun formally in 1990, it was a 13-year effort coordinated by the U.S. Department of Energy and National Institutes of Health. It was originally planned to last 15 years, but technological advances accelerated the completion date to 2003. The projects goals were to

- Identify all the 20,000 - 25,000 genes in human DNA,
- Determine the sequences of the 3 billion chemical base pairs that make up human DNA
- Store all of this information in data bases

The researchers involved in the project also studied DNA of nonhuman organisms. Including the fruit fly and laboratory mouse. Which have surprisingly close genomes to ours. A genome is all the DNA in an organism, including it's genes. Which carry the information for making all the proteins required by all organisms. These proteins that are created by the cells determine the way we look, how well the organism metabolizes food, fights infection, and sometimes even how the behaves.

With that in mind, DNA is essentially a recipe book, and all of the cells are the cooks, and using that recipe book the cells create proteins that are used to keep the organism alive and functional. Now DNA itself is very different. DNA is made up of four chemicals, which are bases and ab-

breviated A, T, C, and G. In certain patters these are found and repeated millions or billions of time throughout any organisms genome.

For example the human genome consists of 3 billion pairs of bases. Compared to the smallest genome which still consists of 600,000 base pairs. The order that these A's, T's, C's, and G's are the most unique and important thing about a genome. It is the key to all of life's diversity, it defines if an organism is human, or a fruit fly. You might be surprised to discover that all organisms are related through similarities in DNA sequences.

A DNA molecule is very unique. At the molecular level DNA looks like a twisted ladder. This ladder actually consists of two DNA strands, this is where the A's, T's, C's, and G's are found. This structure is called a double helix because of the spiral. Each strand of DNA is coiled very tightly inside the cells nucleus. If all 46 human chromosomes from a cell were uncoiled and placed end to end, they would make a string of DNA that is 2 meters long and only 2 nanometers (2 billionths of a meter) wide.

I began this lab by making 30 ml of salt water, and violently swishing it in my mouth. The reason why we used salt water is because when DNA is released from a cell it usually breaks up into tiny fragments. These fragments have a very miniscule negative charge. The salt in the ware is attracted to the DNA fragments and prevent the fragments from attaching to one another. Thus leaving large clumps of molecular material. At this point in the experiment however the DNA was not released from the cells.

After we took a sample of our saliva salt water we added soap to it and shook it gently. The reason for this is to release the DNA from it's cell. The soap that we added broke down the cells membrane and killed any proteins that could have harmed the DNA on it's journey. I was surprised to discover how using many common substances you could actually extract your DNA.

Once we completed that process we added ice cold alcohol. The alcohol allows the fragments of DNA to join together into a blob that we could examine it and see it with our own eye.

It is worth noting that we could have added too much or too little soap into the test tube, not allowing all of the protein to be killed. Other

possible sources of error include: extra food in our mouth, adding to much alcohol.

QUESTIONS TO CONSIDER:

What cells did you collect?

You have DNA in almost every cell in your body. The DNA we collected comes from components of your saliva. Two of the types of cells that we collected (which are components of your saliva) are epithelial (or cheek lining) and B-cells (immune cells which are found in tears saliva and sweat.

Why did you use salt water?

The reason we used salt water is because when DNA is released from a cell it usually breaks up into tiny fragments. These fragments have a very miniscule negative charge. The salt in the ware is attracted to the DNA fragments and prevent the fragments from attaching to one another. Thus leaving large clumps of molecular material.

What did the soap solution do?

The reason for this the soap is to release the DNA from it's cell. The soap that we added broke down the cells membrane and killed any proteins that could have harmed the DNA on it's journey.

What did the alcohol do?

The alcohol allows the fragments of DNA to join together into a blob that we could examine it and see it with our own eye.

In your own words, describe the structure of DNA and explain what its function is.

DNA carries the instructions or blueprint for making all the structures and materials the body needs to function. It contains two double helixes that are connected by base pairs.

CONCLUSIONS:

I learned my hypothesis was correct, I hypothesized that to extract DNA from a cell you would need to open it's nucleus, I also hypothesized that afterwards you would have to concentrate it, so that you could see it, this was also correct. In this lab I learned how complex DNA is. I learned how to extract DNA from cells.

I learned what substances I needed to extract the DNA from the cells. I learned what the substances did to the cell and how they did it. I learned how large DNA is. I learned the different parts of DNA, I learned what base pairs are. And finally I learned where the A's, T's, G's and C's are located on a DNA molecule.

This lab triggered one question:

How do scientists know what A, T, G, or C to change to treat or prevent a disease?

WEB LINKS:

http://gslc.genetics.utah.edu/units/basics/index.cfm
http://www.pbs.org/wgbh/nova/genome/