



Identification of Genetically Modified Food

By Brittany Mehlberg

PROJECT DESCRIPTION

The main reason for attempting this project was to identify genetically modified food using Polymerase Chain Reaction techniques. Many of us have performed Polymerase Chain Reaction in a general education setting whether it be for College requirements or possibly High School. Polymerase chain reaction(PCR) is a method widely used in molecular biology to rapidly make millions to billions of copies of a specific DNA sample, allowing scientists to take a very small sample of DNA and amplify it to a large enough amount to study in detail. Another reason for the experiment was because when I am in a classroom lab setting at Oregon State there is always the pressure for time and the experience becomes a mechanistic exercise that is incompatible with my learning style.

Creating a lab setting in my kitchen was a fun process. Some of the challenge encountered stemmed from lack of space availability and determining which equipment to buy which is a problem solved by utilizing an institution. The results may not be recognized by the science community, but it allowed for a different learning experience without serious expectations. I received some of the equipment from the OSU Surplus such as the microcentrifuge and the DC power supply. The equipment was sanitized upon arrival. Before performing this experiment I never performed PCR, so there were some obstacles. The edvotek 962 guide provided an easy to follow method that is highlighted throughout the presentation.

Here is a bioinformatics overview of the process. DNA is extracted from food samples and replicated using Polymerase Chain Reaction(PCR). The first step to PCR is Denaturation which unzips DNA into single strands by breaking hydrogen bonds. The second step is annealing, this is when primers can base pair with their target DNA sequences. Then the final step is the extension part which is when taq polymerase will extend the primer to synthesize a new strand of DNA.

TEST EQUIPMENT SETUP

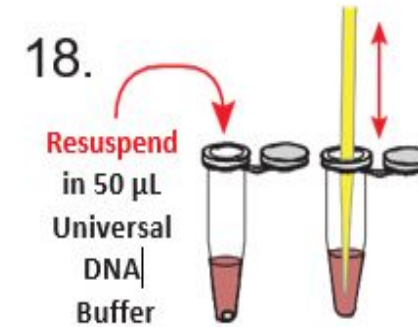
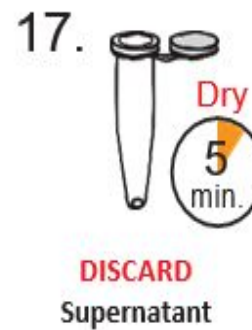
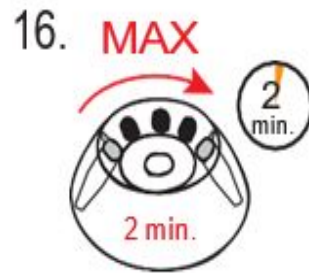
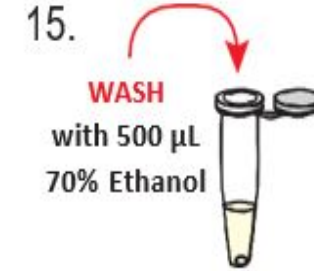
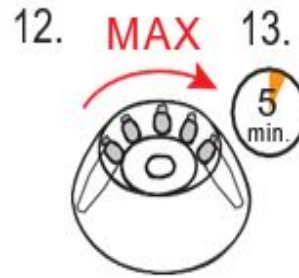
- Edvotek kit 962 PCR-based Identification of Genetically Modified Foods and Plants
- Edvotek Midi-Horizontal Electrophoresis Cell
- Lab Corp Mini E Horizon M#642E centrifuge
- Hybaid Limited SPRT001 Issue 2 PCR Sprint 20-WELL Thermal Cycler Lid Damage
- Fisher Scientific FB300 power supply, 119121, D10c
- VWR Scientific Model TW-26 Transilluminator
- Water bath – Used a cooking pot and 8 250ml bottles filled with water and a thermometer. The tops of the bottles held the microcentrifuge tubes.

MODULE 1: ISOLATION OF DNA FROM FOOD

- **GATHER and SMASH** a small amount of food on a clean piece of paper or in a weight boat.
- **TRANSFER** enough of the smashed food to a microcentrifuge tube to reach the 0.1 mL mark. **LABEL**
- **ADD** 400 μ L of DNA extraction buffer to the food sample.
- Using a micropestle, **GRIND** the food sample until no large pieces remain (approx. 30 seconds).
- **VORTEX** or flick the tubes for 30 seconds to mix the sample.
- **INCUBATE** the samples at 56° C for 15 minutes.
- **ADD** 300 μ L of NaCl solution to the tube and mix well by vortexing or flicking for 30 seconds.
- **CENTRIFUGE** the food sample at full speed for 5 minutes.
- Carefully **TRANSFER** the supernatant into a fresh, labeled microcentrifuge, tube being careful not to disturb the pellet. **DISCARD** the tubes with pellets.
- **PRECIPITATE**(cause (DNA) to be deposited in solid form from a solution) the DNA from the supernatant by adding an equal volume of room-temperature isopropanol to the tube. **MIX**
- **INCUBATE** the tubes at room temperature for 5 minutes.

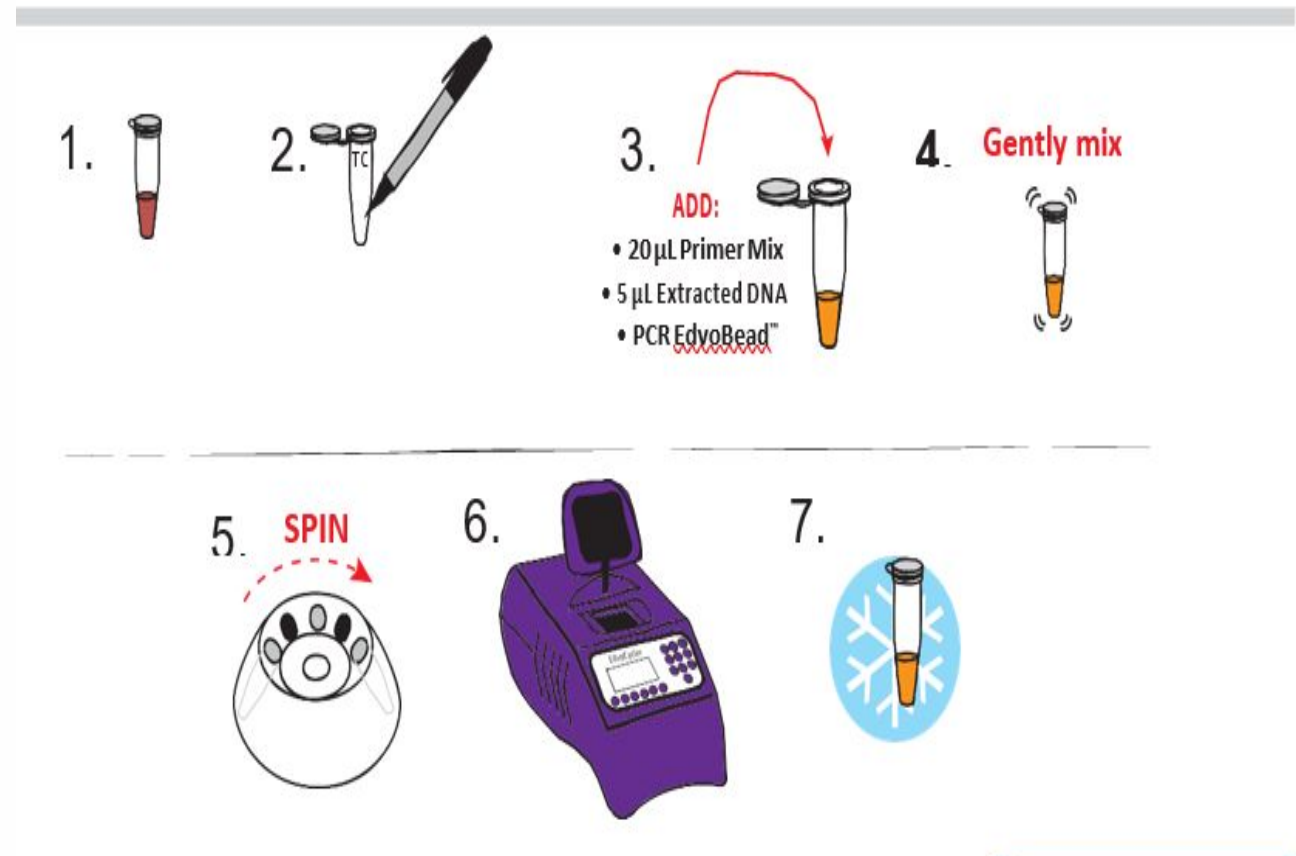
MODULE 1: ISOLATION OF DNA FROM FOOD CONT'D

- The images to the right are the final steps for the isolation of DNA process.

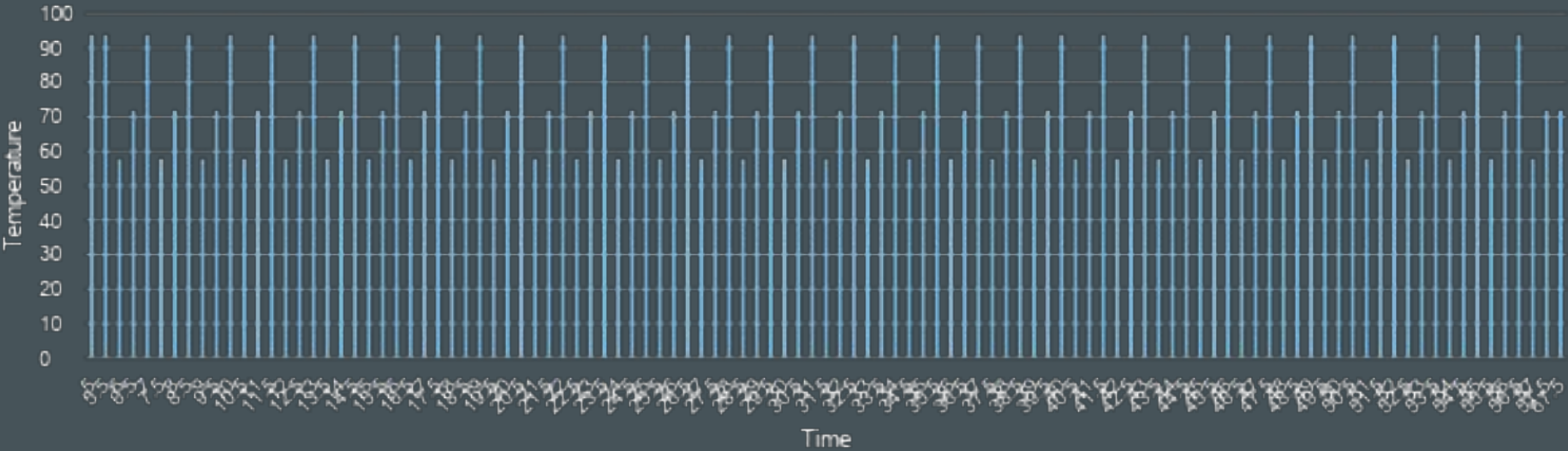


MODULE II: PCR AMPLIFICATION

- Step 1 is obtaining the extracted DNA sample from mod 1.

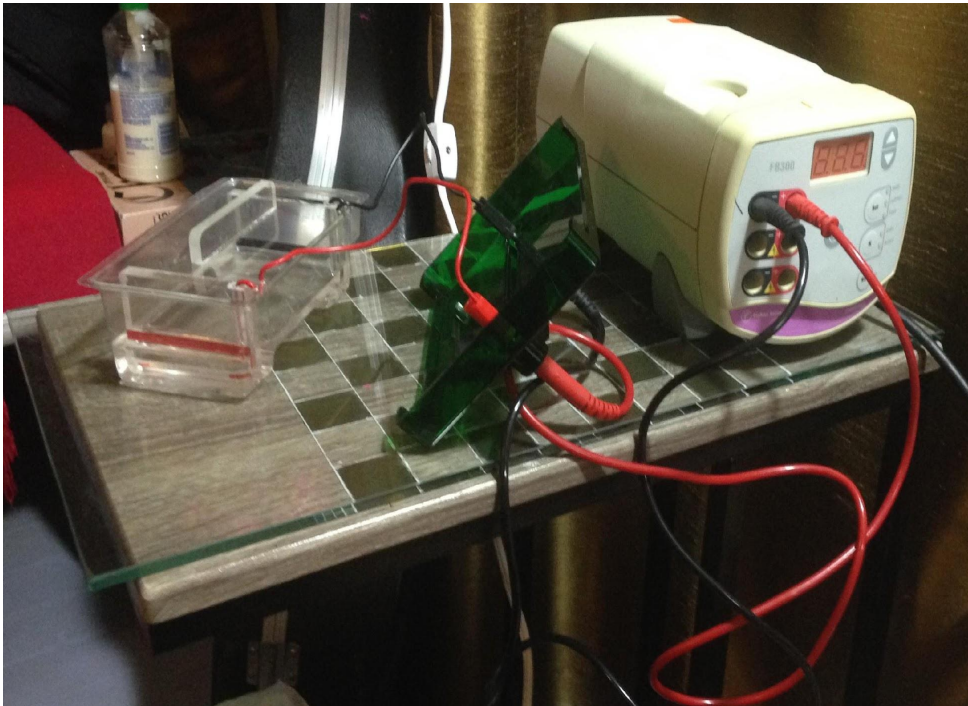


PCR Chart

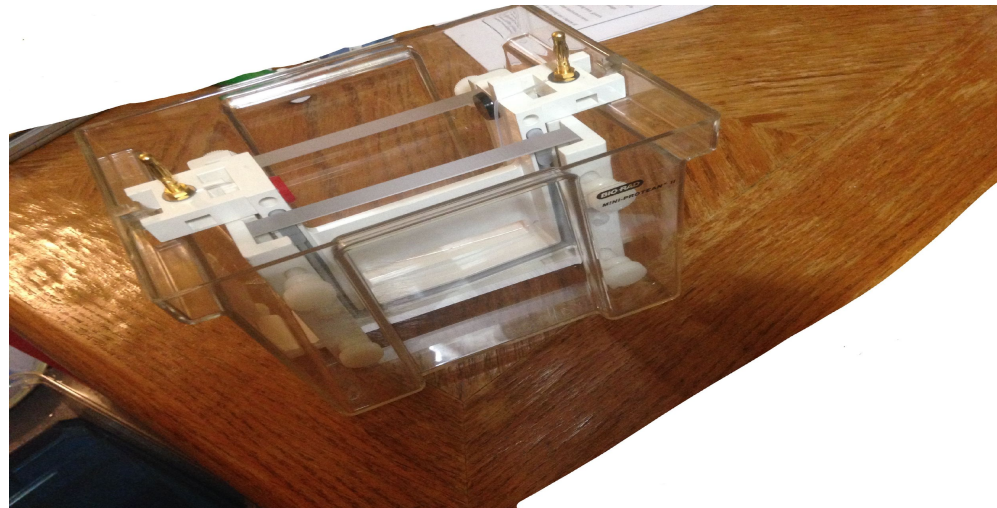


MODULE II: PCR AMPLIFICATION PROCESS CHART

SETUP AND LAB EQUIPMENT FOR GEL ELECTROPHORESIS



Since the cables from the two electrophoresis cells did not fit into the DC power supply I had to use the lid and connector from a Vertical electrophoresis cell to connect the cell to the DC power supply and fortunately it worked! Here is the vertical electrophoresis not used in the experiment but the lid and cables were.





TIME LAPSE VIDEO OF GEL ELECTROPHORESIS

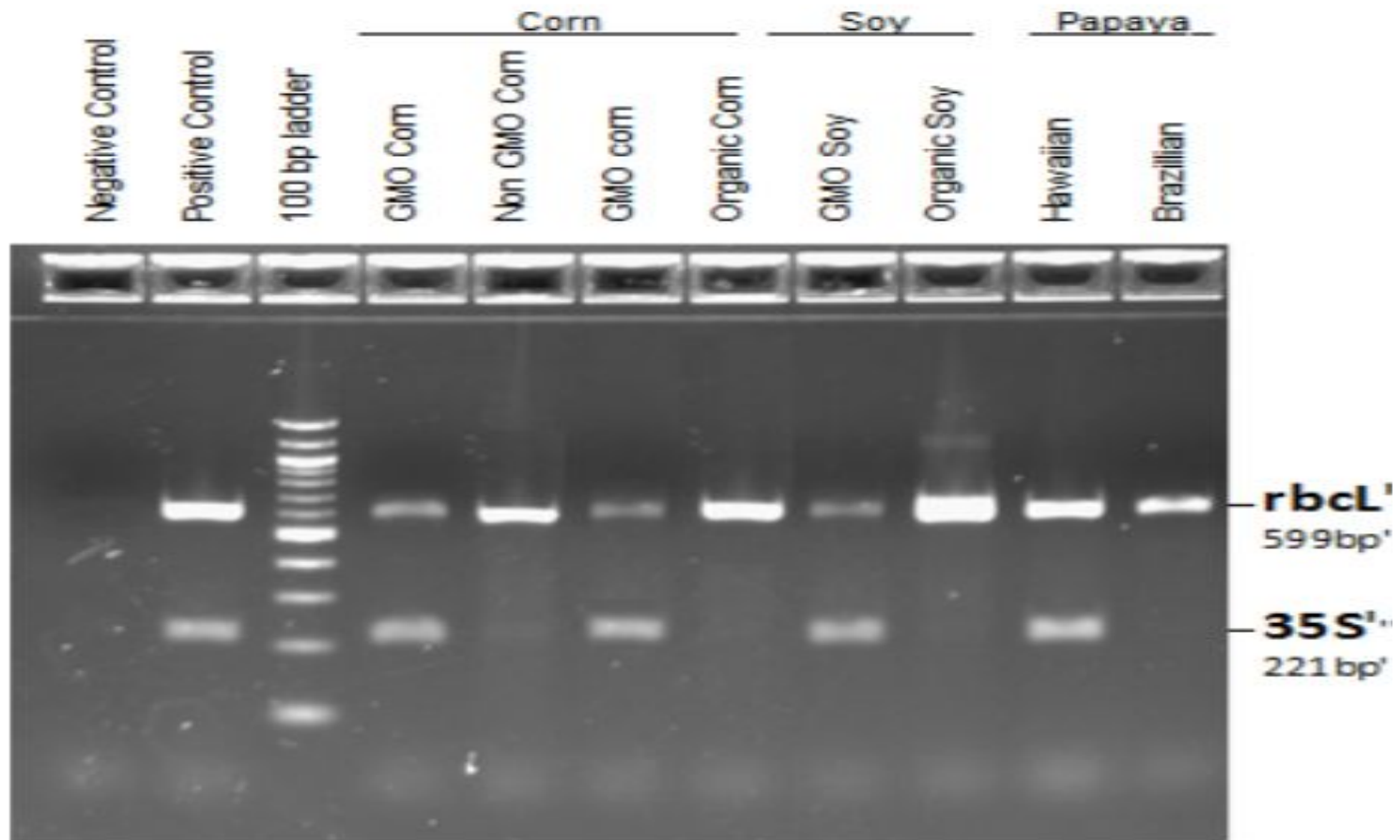
- <https://youtu.be/vE9QdXNbRno>



HOW DOES GEL ELECTROPHORESIS WORK?

- DNA is negatively charged because of the phosphate backbone. The DNA is put into an electric field starting at the negative cathode side of the gel chamber and as electricity moves through the tank the DNA is pulled through the gel. What creates the lines is the different sizes in DNA. Certain parts of the DNA are larger and get stuck in one spot. This is how we can tell what is in the DNA.

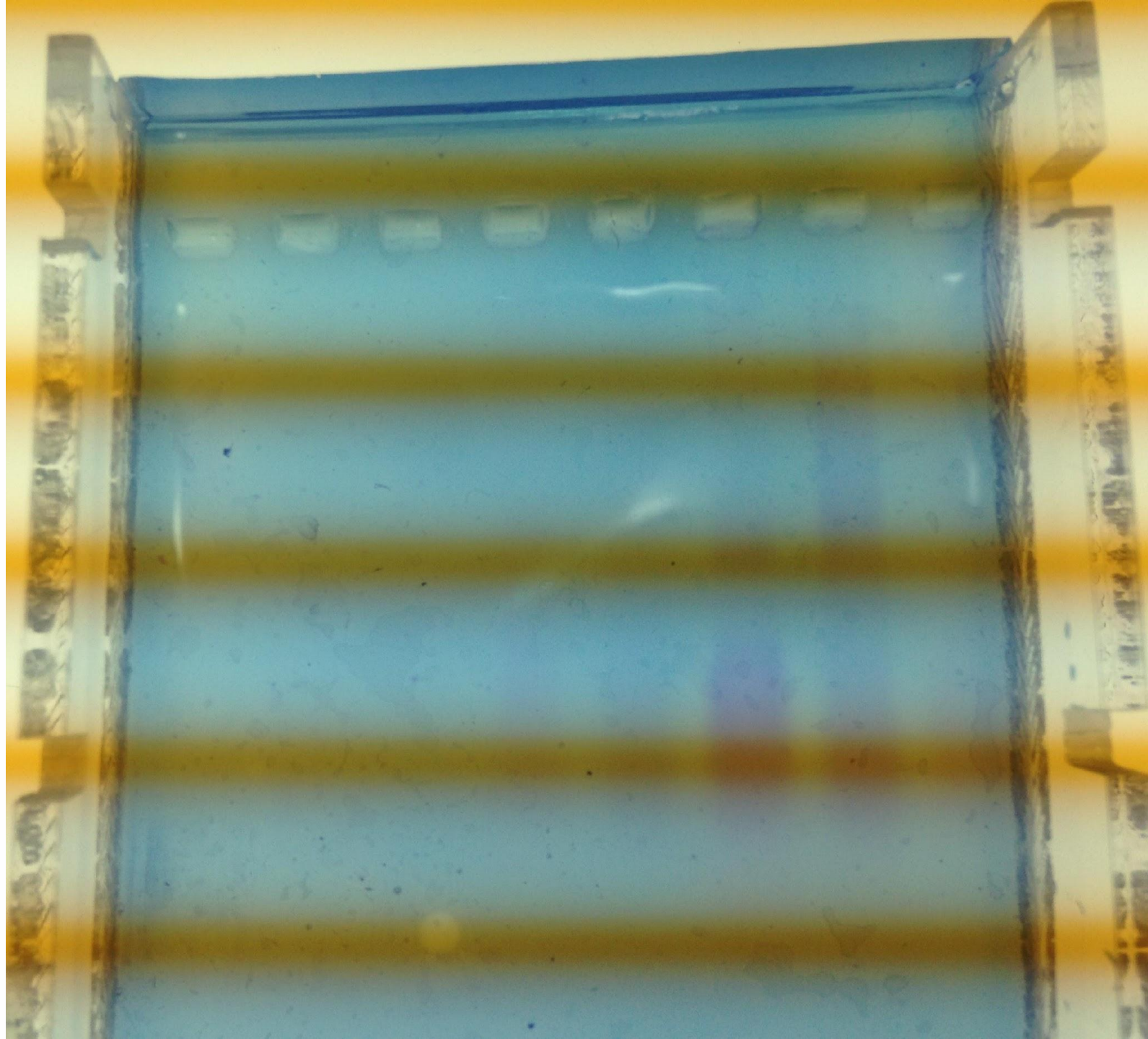
SAMPLE ELECTROPHORESIS GEL



FINISHED PRODUCT

PART 1

- The DNA did stain however it did come out slightly blurry and hard to read. This is because I added the proteinase K to the buffer too far in advance of performing DNA isolation. Starting at the far right is non GMO Green bean(lane 8), next to that is garbanzo bean genetic modification unknown(lane 7), next to that is carrot genetic modification unknown, next to that is non GMO Green bean again(lane 5). It is easy to tell that lanes 8 and 5 look similar because they are both darker.



FINISHED PRODUCT PART 2

For this run the 100 BP came out really well and it is on the far left hand side of the gel and the lines are sharper.

Lane 1 = 100 Bp

Lane 2 = non gmo green bean

Lane 3 = gmo control

Lane 4 = corn sample

Lane 5 = carrot sample

Lane 6 = green bean sample



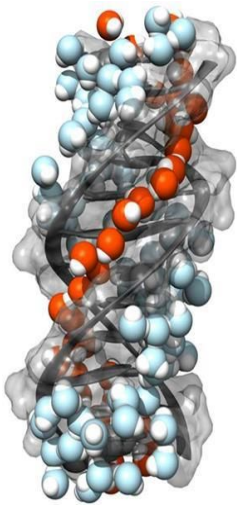


CITATIONS

- <https://images-na.ssl-images-amazon.com/images/I/B1oGqPV0FGS.pdf>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4846332/>
- www.bioinformatics.nl/molbi/SimpleCloningLab/PCR.htm

BONUS VIDEO! HANDMADE SPINE!

Just like people and animals have spines DNA has a chiral spine as well.



I made this out of plasticine clay
and
Polymer clay the light up is from a
UV

Light being shined on it. 😊

<https://youtu.be/WF2HgBfwdrE>