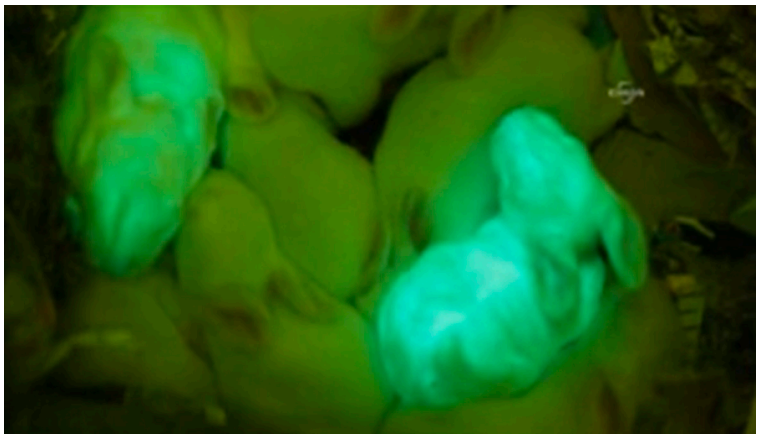
Hello everyone,

I hope you are all doing well.

This semester has been very busy for me! I'm taking some eccentric courses this semester, including a creative writing class and a bi-weekly cadaver lab. I'd love to share some of the things I've learned about anatomy from viewing/touching various parts of human bodies. However, this may be a little grotesque and I wouldn't be able to share the nice complimentary images I usually attach in these emails. So instead, here's what I have been learning in my cellular bioengineering lab course so far…

For the last couple weeks or so we have been using molecular biology techniques to modify and clone cells! Remember the infamous genetically engineered glow in the dark bunny?



We have been performing similar projects in this lab, but of course, at a much smaller scale. Specifically, we have engineered plasmid DNA to have specific fluorescent genes, inserted them into bacteria, and then viewed them under a fluorescence microscope.

In this email, I will be sharing a technique we learned called gel electrophoresis which is used to separate fragments of DNA.

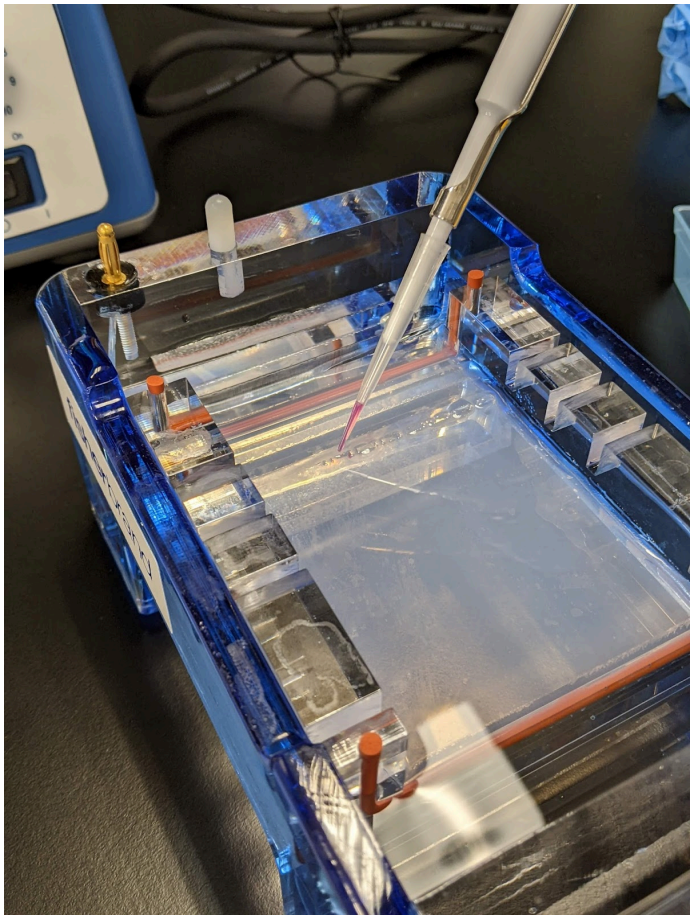
Gel electrophoresis is used to distinguish different fragments that together, create a whole strand of DNA. Essentially, what happens in gel electrophoresis is:

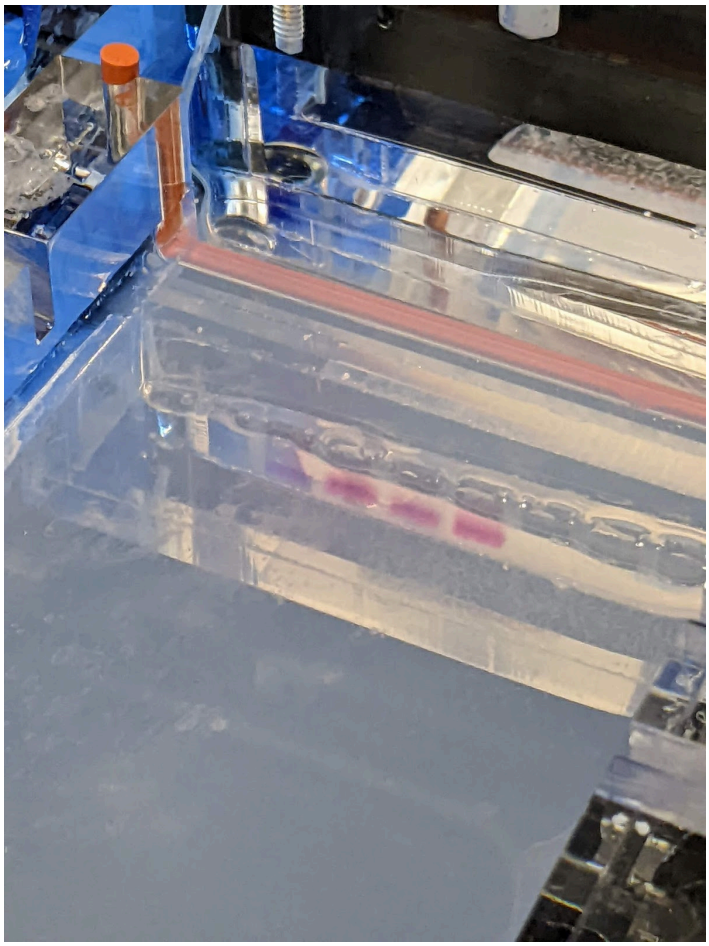
(1) DNA samples (already cut into fragments) are loaded into individual wells in a jelly substance
(2) An electric current is created within this gel
(3) The DNA fragments wiggle their way and travel through the gel

DNA is negatively charged so when a current is established, the fragments travel towards the positive end. Additionally, since differently sized fragments travel at different speeds, we can count how many fragments are present in a sample of DNA and determine what their sizes are.

So now looking at the steps of gel electrophoresis with complimentary photos…

1. Loading the DNA into the gel!

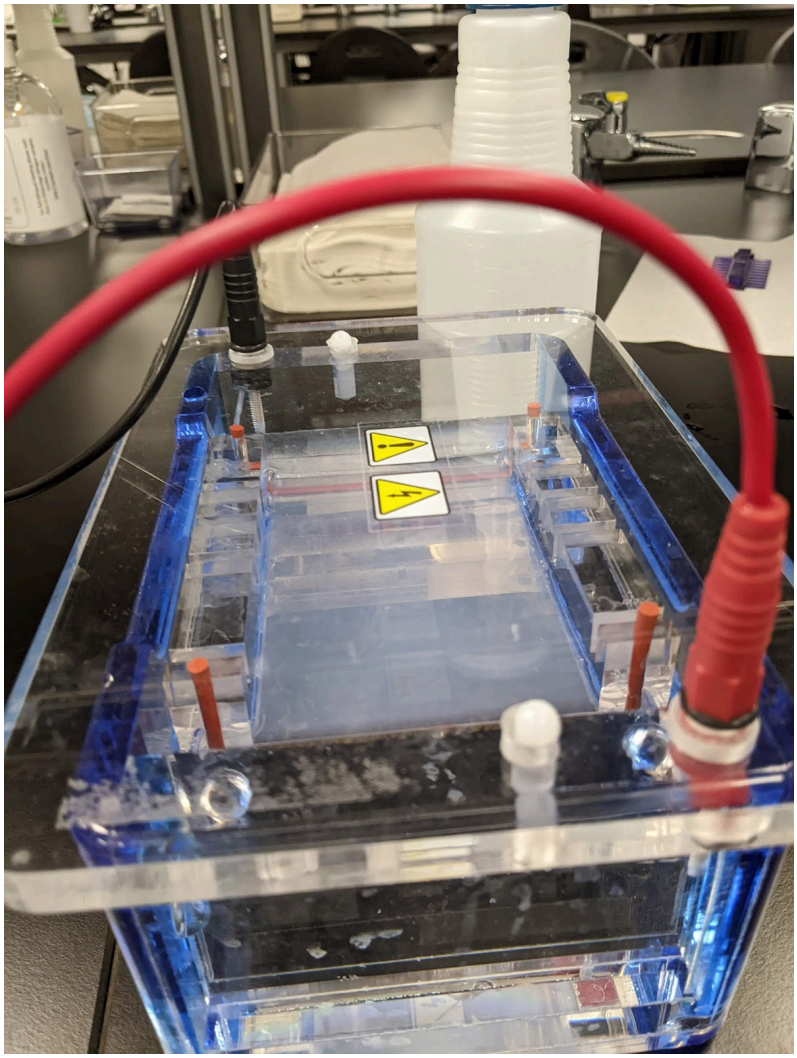




So hopefully you can see in the image above, DNA samples (dyed purple) were inserted with a pipette into tiny little wells in a gel-like substance made from agarose. It's hard to see, but the gel substance was also submerged into a salt buffer, which provided the necessary ions to facilitate the flow of electricity.

In my lab, each DNA sample was treated uniquely with different enzymes. Meaning each DNA sample was cut up into a different number of fragments. So it was expected that when the samples were imaged at the end of the lab, each well would show unique fragments.

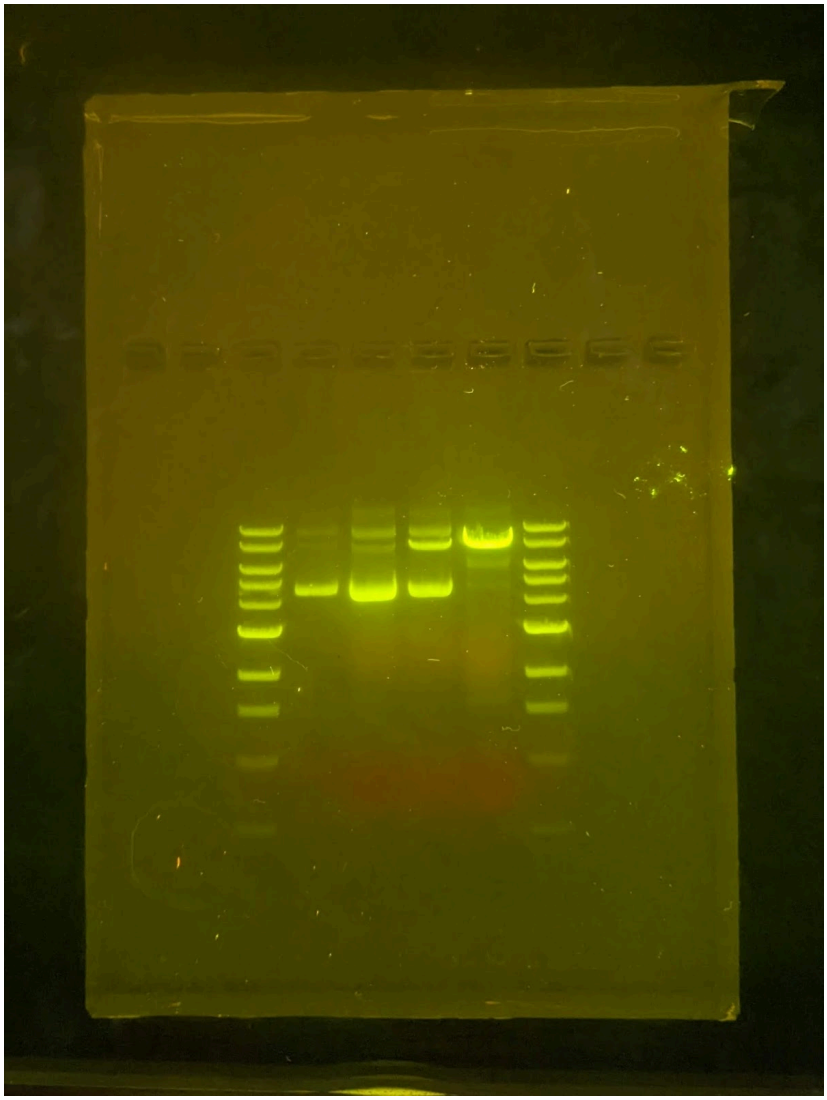
2. Create an electric current!



So in this image here, we can see that the gel has been connected to an electrical circuit. The black wire (connected to the top of the box) was negative, while the red wire (connected at the bottom) was positive. Since the DNA fragments were negative, they traveled down the gel towards the positive end.

So the purpose of the gel here was to actually slow down the DNA fragments from traveling too quickly. Without the gel, all the DNA fragments would immediately travel to the positive end, and we wouldn't be able to see the difference in speed from the individual fragments.

3. See results!



After running the gel with an electrical current for over an hour, these were the results. Each tiny horizontal line in a lane represents a fragment of DNA. So for example in the 4th lane from the left, you can see 3 noticeable green strips, meaning that there were 3 fragments that composed that sample of DNA.

The very far left and right lanes are controls, meaning they were set references to determine the size of the fragments from the 4 middle lanes. Specifically, if you wanted to find out the size of the DNA fragment from the 2nd lane from the left (the one with one very bright strip), you could say it was around the same length as the 4th strip from the top of the left control lane. And say this 4th strip had a set value of 1000 bp.

Anyway, that's all for this email. Feel free to reply with any comments/questions.

Hope you all have a great week.

Sincerely,
Lillian