

CRISPR and Genetic Engineering

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First and Seconds Semesters
Kent Denver Innovative Scholars Program

Biology
Ms. Park and Dr. Caulfield

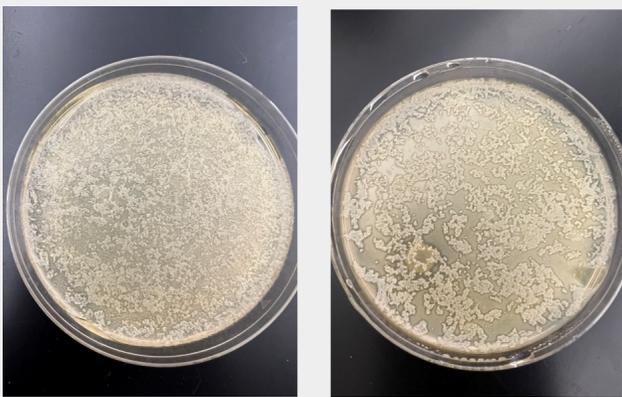
OVERVIEW

Semester 1: This semester was an opportunity for me to learn a lot about how to work in a lab, including how to prep and operate various types of equipment.

Semester 2: This semester I focused on a more advanced lab that taught me more about genetics and CRISPR.

RESEARCH

Background research included watching video explanations, reading published papers, and researching current news articles relevant to the topic. I still keep up with many of the current events with CRISPR. There are so many breakthroughs and interesting things happening, it is hard not to!



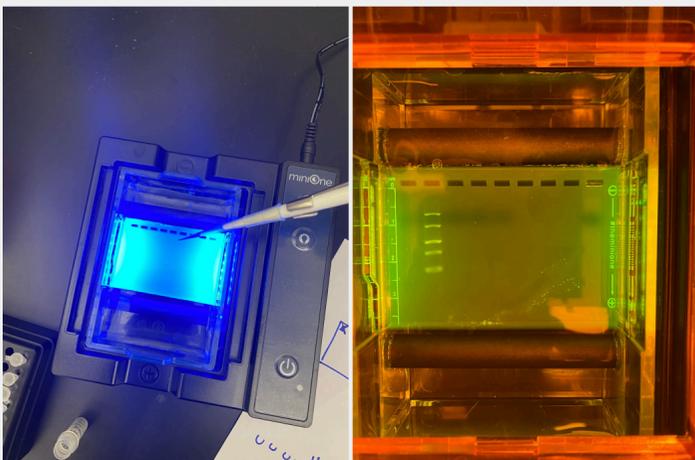
Semester 2: control (left) and Andhra (right)

Taste of Genetics: This lab explored the TAS2R38 gene, covering genetic analysis, bioinformatics, population genetics, and evolution, making it a great beginning lab. I learned about the PTC gene, and attempted to discover my own genotype.

Exploring the CRISPR-CAS Defense System: This lab explored antibiotic resistance, and what human activities and biological processes contribute to it. It involved incubating bacteria (staphylococcus) with microscopic organisms to explore relationships.

PROCEDURE/DESIGN

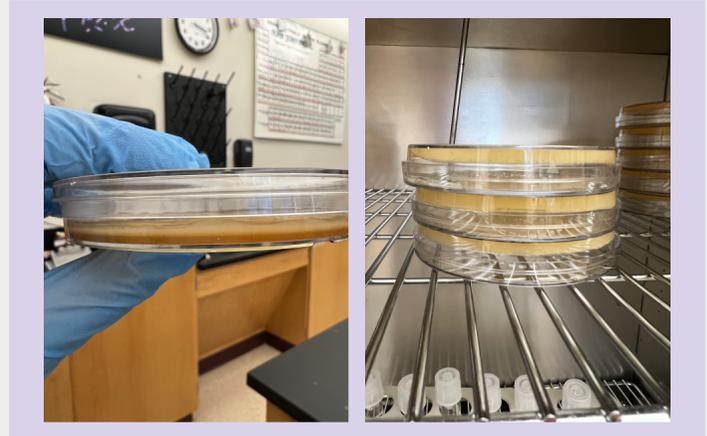
Both my semester 1 and semester 2 labs came with written lab procedures to follow. This made things really easy for me to know what to do, but I also learned a lot in the process as I was introduced to new vocabulary and wording that is used when referring to lab procedures. Between the two semesters, I completed labs from two different companies: MiniOne and Carolina. The Carolina lab was much more detailed and had a larger procedure. The MiniOne lab did not have enough instruction and detail, and the experiment did not give me the desired result. This meant as a new student in a lab setting, I did the best I could, but part of everything I did was best judgment which was not always correct. That room for error was not an issue with the Carolina lab.



Semester 1: Electrophoresis before and after

ANALYSIS/RESULTS

First semester, I did not get the results I desired from the lab. After completing the steps as best as I could, nothing but the control showed up in the PCR. This was really upsetting because it took a lot of time and I wanted the lab to be successful. Second semester, I had much more success with my lab. I was able to culture bacteria without fail, and use that to look at staphylococcus and different strains that were or were not resistant to antibiotics.



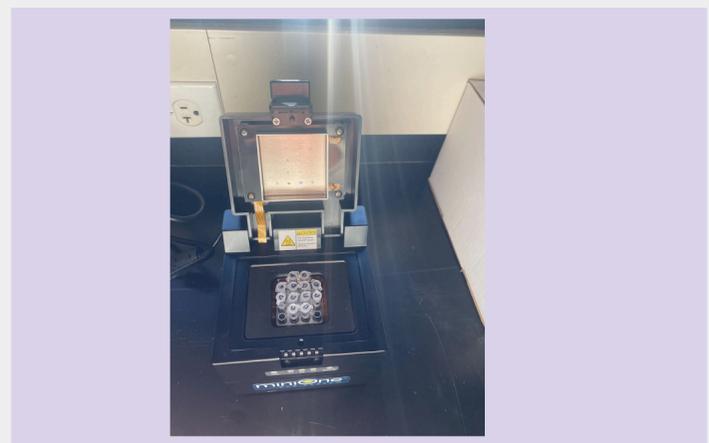
Semester 2: two layer agar (agar) and storage (right)

Over the course of the year, I learned to use many different machines:

- PCR: Used to amplify segments of DNA
- Centrifuge: Used to separate components of a fluid
- Agitator: Used to mix components of a fluid
- Gel electrophoresis: separates DNA fragments

I used many other lab tools during my time, including pipettes, micropipettes, beakers, hotplates, water baths, and other basic objects.

Safety: I took extra precautions and always wore gloves to ensure I did not get my samples on myself, or anything into my growing bacteria during second semester.



Semester 1: PCR sample loading

CONCLUSION

This year, I learned a lot about DNA technology in the form of PCR and electrophoresis. Over the summer, I am taking chemistry at the University of Indiana online to take AP biology as a sophomore to continue furthering my innovation scholars work in the field of genetic innovation. I have several ideas on what I may do next, including: genetically modify vegetables, and/or an internship.