

# INTRO TO BIOTECH

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### OVERVIEW

This project was designed as an introduction to the various areas of biotechnology in the hopes of finding specific interest areas and gaining a better overall understanding of the principles of biotechnology. It included reading, labs, and outside research to better understand the basics.

### WHAT IS BIOTECH?

Biotech is a rapidly growing field of biomedical engineering. It is essentially mixing biology and technology to create new advancements based on biological functions. Biotechnology can help improve a wide range of fields, including agriculture, industrial production, and environmental health. However, I am most interested in biotechnology as it relates to medicine. Some examples of biotechnology in the medical field include vaccines, synthetic insulin, and regenerative medicine. It can also be used to modify crops, discover new ways to breakdown waste products, create biofuels, and help clean the environment.



FIGURE 1: An example of the various areas biotechnology can be applied to

### RESEARCH

. Throughout the semester, I researched the basics of biotechnology including Restriction Enzymes, Polymerase Chain Reactions, and Gel Electrophoresis.

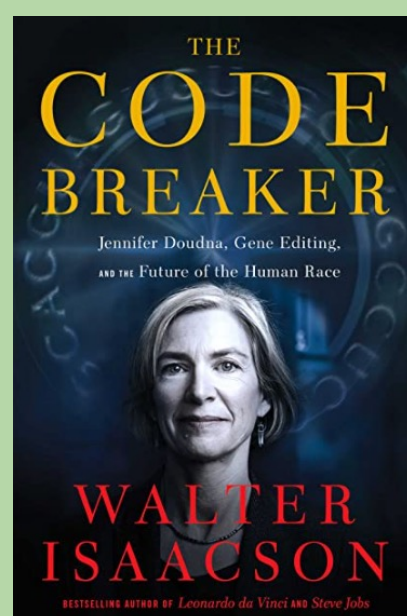


FIGURE 2: "The Code Breaker" by Ewalter Isaacson

Specific diseases I focused on included Huntington's and Cancer. I began the semester reading "The Code Breaker", by Walter Isaacson. This book discussed the science behind CRISPR technology, Beginning with the history of RNA research, and continuing through the race to make CRISPR compatible in humans, this book was a very solid introduction to biotechnology. After reading The Code Breaker, I watched videos and read articles to review DNAs structure and learn how restriction enzymes and PCR work. I learned how PCR machines rely on extreme temperature changes to mimic the conditions for DNA replication to amplify a specific strand of DNA,

### LABS

Throughout the year, I did a couple of different labs to learn how different technologies worked. I started with a restriction enzyme lab to see how restriction enzymes are used in DNA cloning and genetic engineering. In this lab, I used gel electrophoresis to see an uncut piece of DNA compared with that same strand of DNA exposed to different restriction enzymes.

After the restriction enzyme lab, I ran another lab to see the practical uses of gel electrophoresis. This lab focused on Huntington's disease. I tested the DNA from both chromosomes of two individuals and predicted how long their DNA strands would be. This lab also included creating a pedigree to learn how Huntington's is passed on and how it progresses through generations.

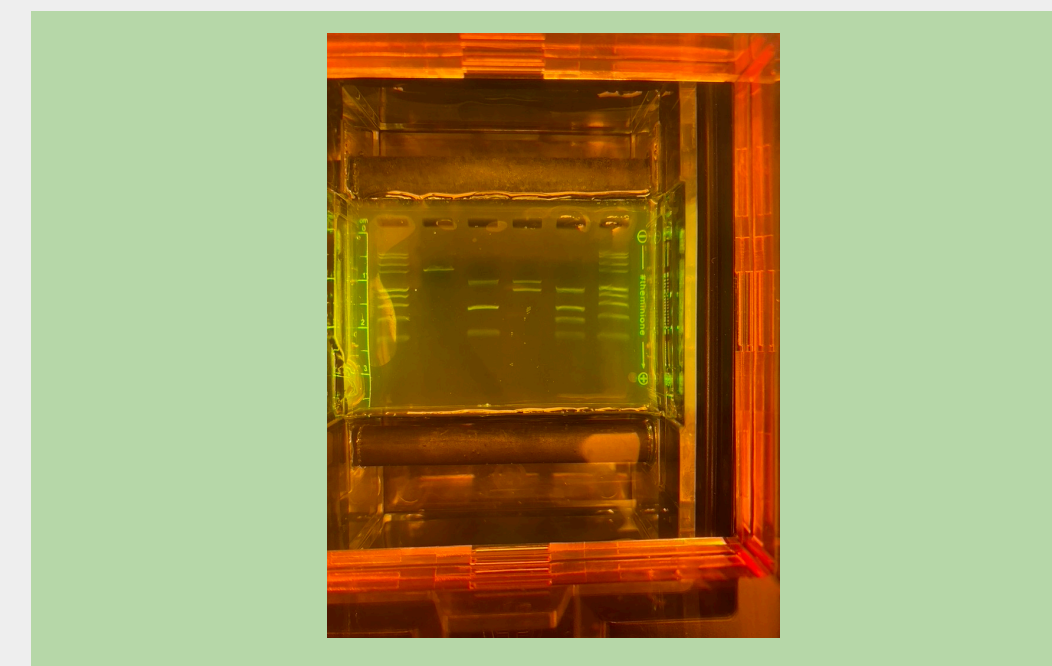


FIGURE 3: Gel results from restriction enzyme lab

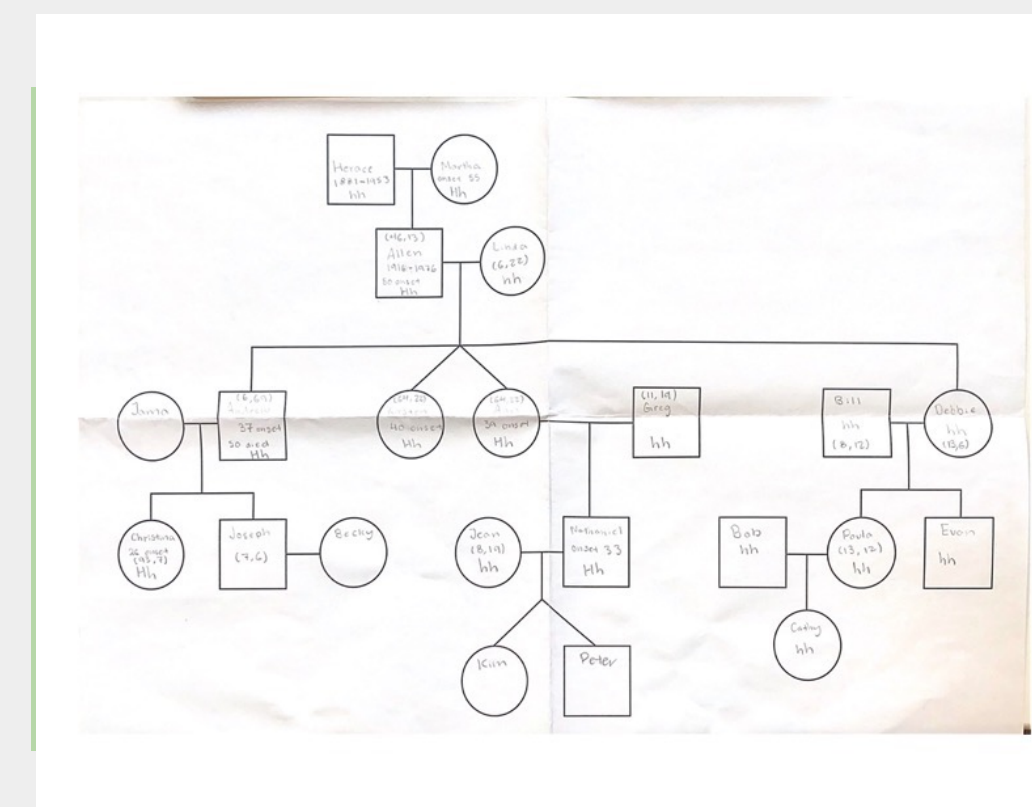


FIGURE 4: Huntington's Lab Pedigree

In this lab, I not only learned the science behind how Huntington's works, but I was also tasked with considering the emotional and moral implications of testing for life-changing diseases like Huntington's. For example, the post lab questions asked me to consider the pros and cons of getting tested for Huntington's, and what things on this list would be most important for me. It was a really good experience for me to answer these tough questions as it allowed me to consider how science impacts real peoples lives. Some examples of factors on this list included familial relationships, work relationships, quality of life, and future family/spouses.

### NEXT STEPS

I hope to continue learning about biotechnology with a more cancer specific lens. Next fall, I plan on competing in NASA's "Genes in Space" competition, which requires creating a genetic experiment to be run in space. I am also going to look into internships or interviews with the cancer researchers at CU Anschutz to understand real life research being done.