

DNA Repair in E Coli

Research Question

What proteins are expressed through E Coli when varying amounts of Ultraviolet stress is applied?

Project Design

The objective of this project was to gain understanding for the responses proteins exhibit within E Coli, when put under Ultraviolet stress. Through using SDS-PAGE to explore identifying trends in proteins present.

Data Analysis & Results

Due to variances data was unable to be properly collected.

Conclusions

If conducted accurately, I conclude there should have been data which accurately aligns with the repair response the proteins enable.

DNA Repair in E Coli

2/2026

What proteins are present after Ultraviolet stress?

My project is about observing how UV stress affects DNA repair genes, and what this means down to the protein. Depending on the amount of Ultraviolet stress applied, mutagenesis is enabled. In this process this looks like DNA damage being created, which in return stalls DNA replication, and eventually enables a SOS response. This product is possible due to specific proteins being released. Data on this phenomenon has been collected and explored previously.

Methods

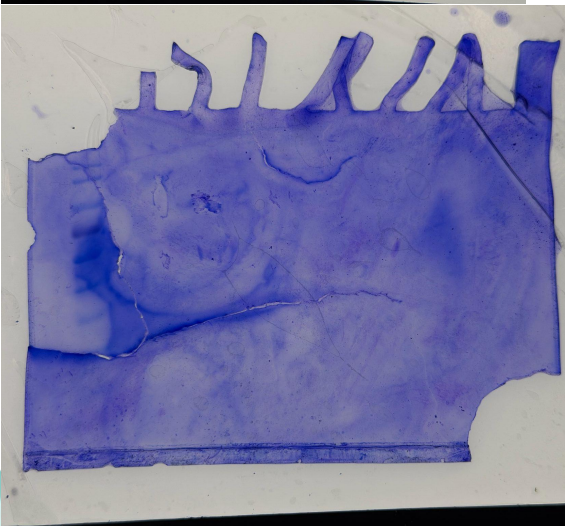
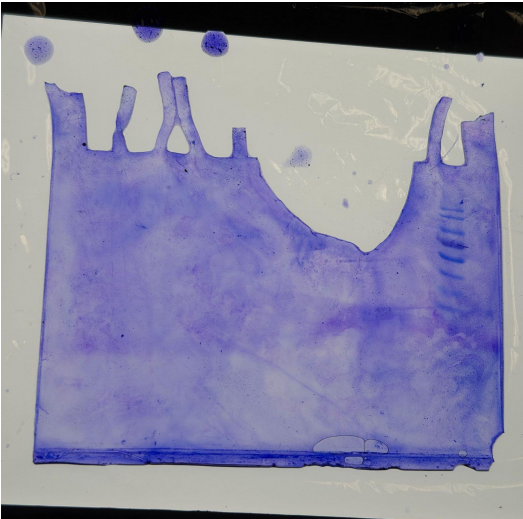
- Collect materials
 - LB Agar Plates
 - Sterile supplies (IE: swabs, isolation loops, ext.)
 - Stock Bacteria (E Coli with GFP)
- Label and Divi Up Plates
- Create Bacterial Lawns
- Apply Ultraviolet Stress to plates for desired times
 - High: 4 Hours
 - Medium: 3 Hours
 - Low : 1 Hour
 - Control: 0 Hours
- Determine Protein Concentrations
- Conduct SDS-Page
- Record Data

Variances:

- There was a switch up in the plates, low and medium trials got switched.
- Did not cover first attempts at the gels while staining.
- Ripped first attempt at gells
- For protein concentrations, seeing as no dilutions were needed, I just added a fixed amount of the dye to each sample.

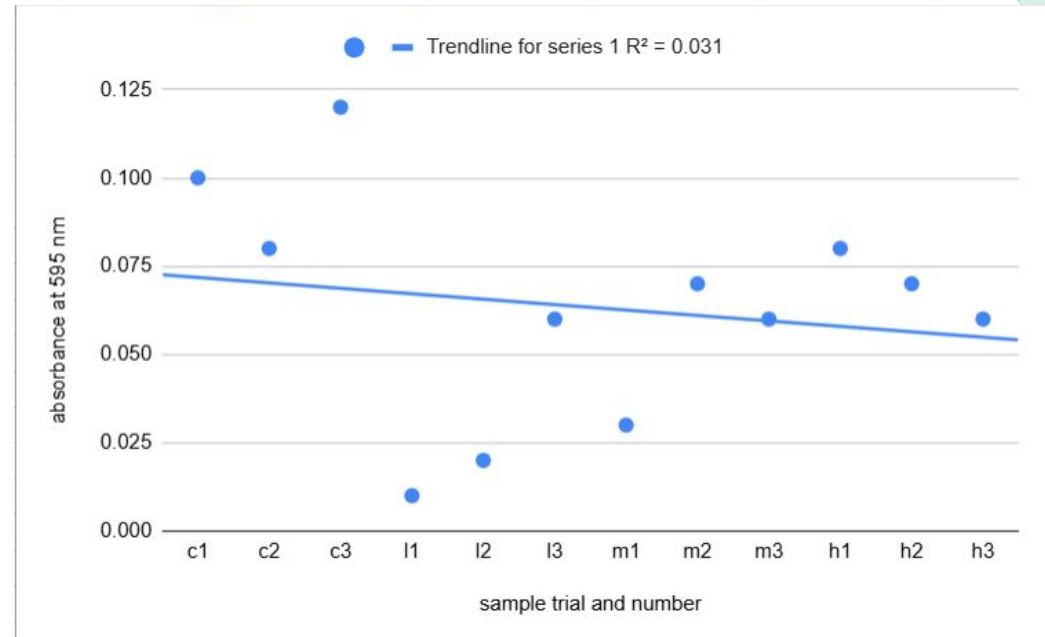
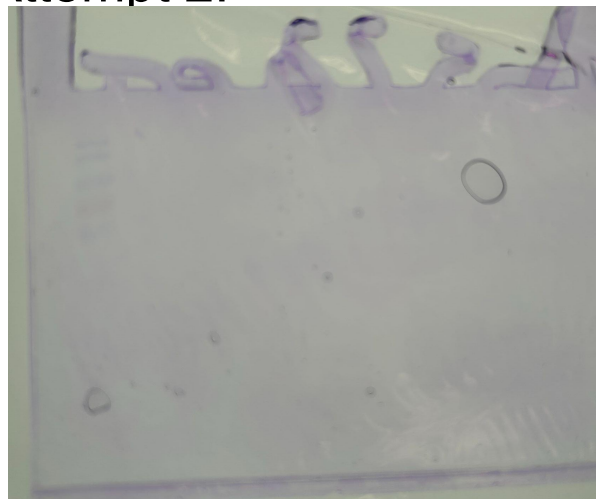
Results

Unfortunately, There was real data to collect from this lab.



Attempt 1:

Attempt 2:



Here is the graph created while measuring protein concentrations.

Discussion

I attempted the SDS part of this lab twice, because the gels came out rather dry or brittle after the staining and destaining process. Besides the texture and the plethora of rips the Gels acquired, I would have been challenged to precisely and accurately collect data, if there were any visible bars. Unfortunately, there were no visible bars present.

Since the first attempt left me lacking results I attempted this process again. Attempt two left the Gels far more attached, and a better texture, since variables were accounted for and altered. However, after destaining the gels it became apparent that there were no present bars. The reason for said results were probably a previous variable.

For possible adaptations I would add to how I carried out this experiment, now knowing what I know, I would implement my plates to higher levels of UV stress, and for longer durations of time. I would make sure to carry out the concentration calculations more meticulously. And ensure handling the gels more delicately.

If I were to carry out this experiment accurately and achieved data, I would expect to have seen a difference in Proteins seemingly present through the differing stages in the UV stress. This is because as UV stress is applied, the SOS response is triggered. This goes to promote mutagenesis until the UV stress has passed a certain threshold. Therefore, if applied for enough time, i would have expected to see differing protein appearances between the levels.

Implications for Future Research

Looking into Ultraviolet stress on E Coli is a very beginner level experiment to the plethora of research pertaining Ultraviolet damage that is carried out. This project can give insight just to how some organisms react to Ultraviolet stress.

References

<https://pubmed.ncbi.nlm.nih.gov/40462972/>

Induced tolerance to UV stress drives survival heterogeneity in isogenic E. coli cell populations by Shunsuke Ichikawa.

<https://pmc.ncbi.nlm.nih.gov/articles/PMC11601333/>

UV-B-Induced DNA Repair Mechanisms and Their Effects on Mutagenesis and Culturability in Escherichia coli, by Sreyashi Ghosh.

<https://pubmed.ncbi.nlm.nih.gov/2994755/>

The SOS system, by R d'Ari.

