JANTHINOBACTERIUM LIVDUM

Monique's summer research project

Mentor : Dr. Ben Lungdren

KEY WORDS

& EXPLANATION

RPON

A process in which scientist can learn how bacteria make things they need to survive and grow.

ENVIRONMENTAL STRESS

a concept in which you put pressure

GRAM NEGATIVE

A tougher bacteria with a protective layer and prone to turn red/ pink. Used to tell what kind of bacteria it is

VIOLACEIN

A defense mechanism to fight off bacteri, fungi

GENE TRANSMISSION

Genetic information passed to offspring

AUTOCLAVE

Used to sterilize, media, water, and clean tools

GENE EXPRESSION

How gene can control the way they are expressed or placed when pressured to adapt to environment.

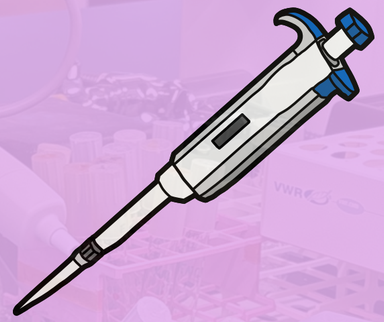
PLASMID

Tiny piece of DNA

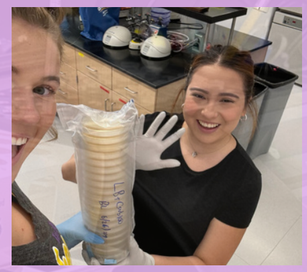
AGENDA

Abstract

Background



methods/ limitations



What's next & acknowledgments

References

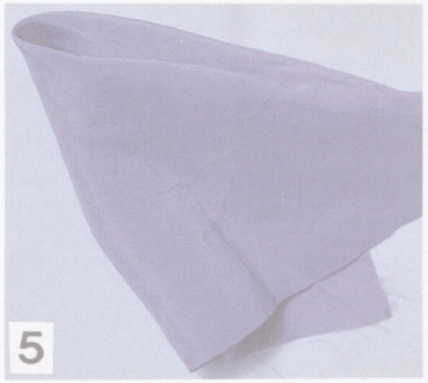
QUESTIONS AT THE END !!

ABSTRACT / RESEARCH QUESTION

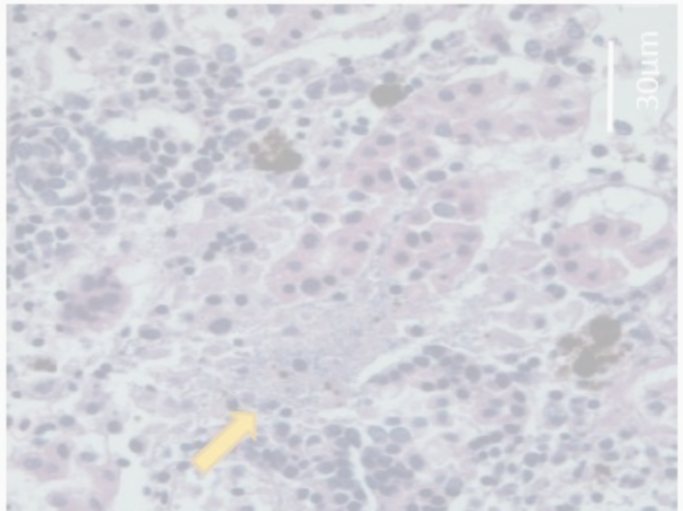
This research aims to understand and identify the role of RpoN within the adaptability of *Janthinobactierum* strain 12473 and the implications in violacein production. It's critical to analyze *J.lividum* to see which nitrogen source, *J.lividum*, can exponentially grow the best and emit violacein under experimental stress conditions.The methodology used in this research was quantitative and qualitative measures. I looked into its resistance by data recording and observations while referencing research articles that also share similar antibiotic testing methods, growth conditions, and observations of the samples throughout lac assays, culture growth of plates and other experiments. RpoN contributes to the understanding of environmental stress on *Janthinobacterium lividum* and can give insight how we can potentially use this to understand the limits of violacein. Furthermore, using this data we can address that *janthinobacterium* holds a key in how we can produce and implement violacein findings to help further research in medical applications with violacein.

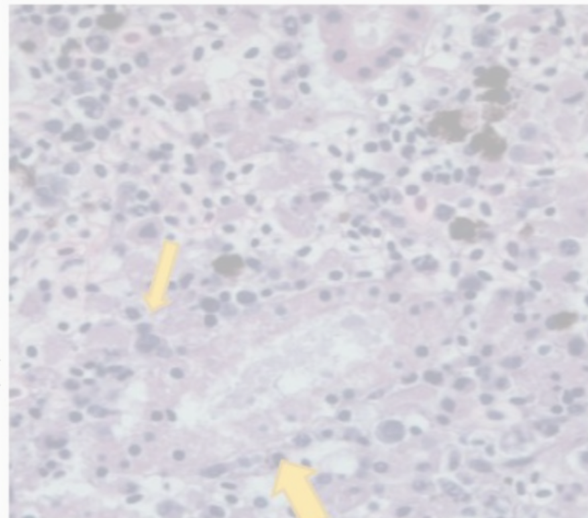
BACKGROUND ON J.LIVIDUM

Janthinobacterium lividum, **a gram negative soil-dwelling bacterium commonly found in lakes, soil, rivers, and arctic glaciers. *J.lividum* has become more prevalent in science research because of the interesting research studies it's involved in. One of the studies *J.lividum* has negatively affected trout industries in Korea, a popular food source in Asian countries. The research focused on the infection process the bacteria had on the rainbow trout. However, in another study *J.lividum* produces violacein that emits a purple color when fighting off fungi, and bacteria. Violacein is an important byproduct of this bacteria that aids in medical applications. An article published by American Society for Microbiology, states the strain 12473 of *J.lividum* helps in biosynthesis of the antibiotic daptomycin and anti-cancer compound epothilone.**



In Addition, the violacein production of J.lividum is affected by environmental stress in global locations, it is found. Meaning whether it's located in The Americas, Korea, and Europe or Antarctica, environmental factors affect the strain by salinity levels, soil components, temperature the strain is found in. Therefore, Knowing this it's important to study and continually test this adaptive bacteria's resistance, metabolism and growth conditions when fighting off bacteria and fungi. Therefore, by using RpoN we can understand how janthinobacterium lividum regulates its gene expression enabling the transcription of certain genes, particularly those involved in nitrogen metabolism and induction of violacein.



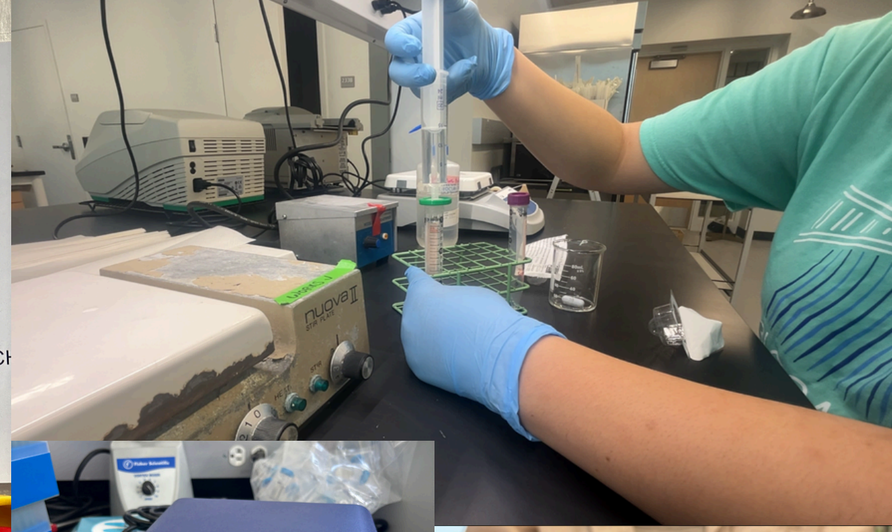


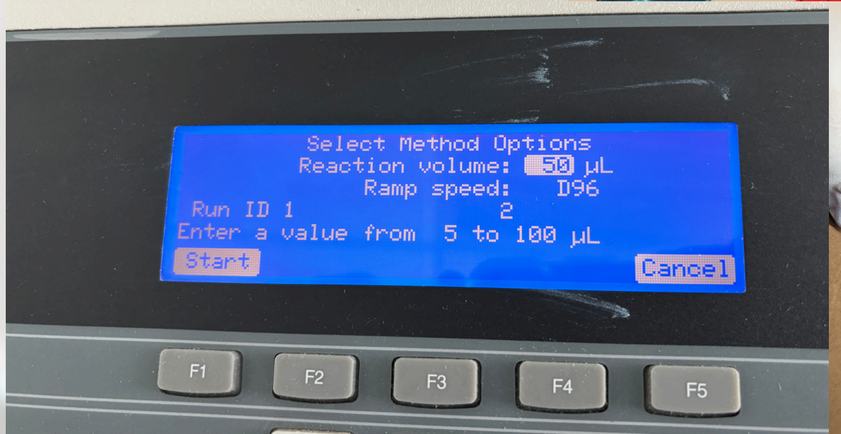
METHODS USED:

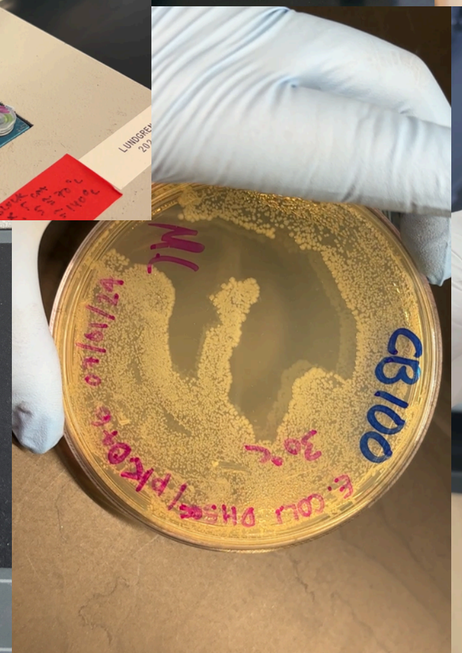
Lac assays / plate streaking
abs buffer making / excel
defending / autoclave
filtration/electroporation and electrophoresis
media culture
biofilm prep

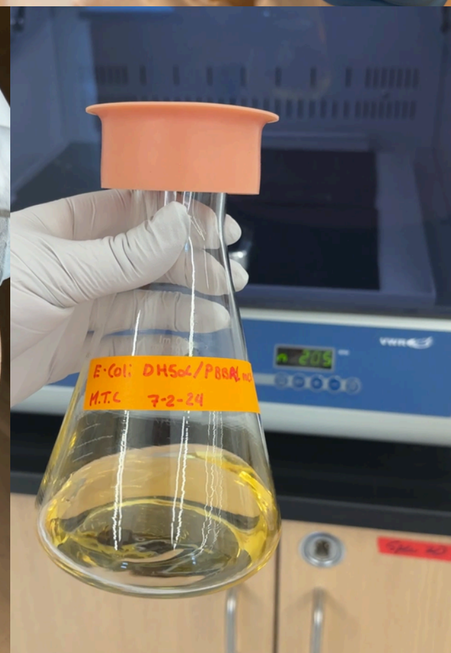
The quantitative data I analyzed a table of an absorbance spectrum of my samples at 420 & 600 comparing KNO3 and NH4Cl interactions with a *J.l* plasmid. Quantitative data in my research also looks at positive or negative outcomes on growth of bacteria or emission of the color purple which means that violacein is working and also keeping note of the amount of grams I used while creating my own stocks and media.

Some of the qualitative data while studying *J.lividum*, noting observations of color and taking pictures and videos throughout my research experiment to note how I observed results and performed techniques.





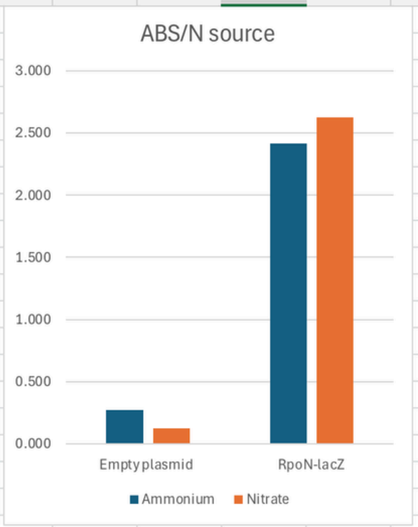




Data tables

Sample #	Abs 600	Actual Abs 6	Srt (min)	End (min)	RXN time (	Abs 420	Miller unit	Miller mean ur	STRD DIV
M1	0.261	1.57	1.5	1337.5	1336	0.622	2.973	2.415	0.53776709
M2	0.130	0.780	1.5	1337.5	1336	0.198	1.900	2.415	0.53776709
M3	0.162	0.972	1.5	1337.5	1336	0.308	2.372	2.415	0.53776709
M4	0.230	1.38	0.5	1336.5	1336	0.657	3.564	2.622	0.85393108
M5	0.236	1.42	0.5	1336.5	1336	0.359	1.898	2.622	0.85393108
M6	0.193	1.16	0.5	1336.5	1336	0.372	2.405	2.622	0.85393108
R1	0.210	1.26	13.5	1340.5	1327	0.037	0.221	0.269	0.05930713
R2	0.116	0.696	13.5	1340.5	1327	0.031	0.336	0.269	0.05930713
R3	0.155	0.930	13.5	1340.5	1327	0.031	0.251	0.269	0.05930713
R4	0.270	1.62	13.0	1338.5	1325.5	0.016	0.075	0.123	0.05612797
R5	0.143	0.858	13.0	1338	1325	0.021	0.185	0.123	0.05612797
R6	0.249	1.49	13.0	1338	1325	0.022	0.111	0.123	0.05612797

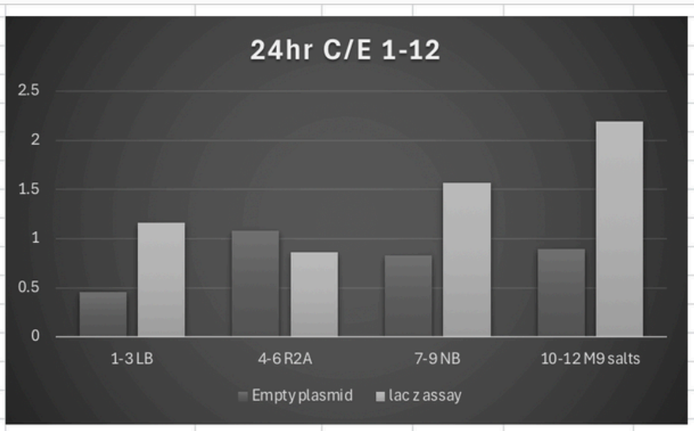
KEY	KEY		Empty plasm	RpoN-lacZ	STDEV E-pla	STDEV lac
KNO3	PBR1 1007	Ammonium	0.269	2.415	0.0593071	0.53776709
NH4Cl	PBBR MSC-5	Nitrate	0.123	2.622	0.056128	0.85393108



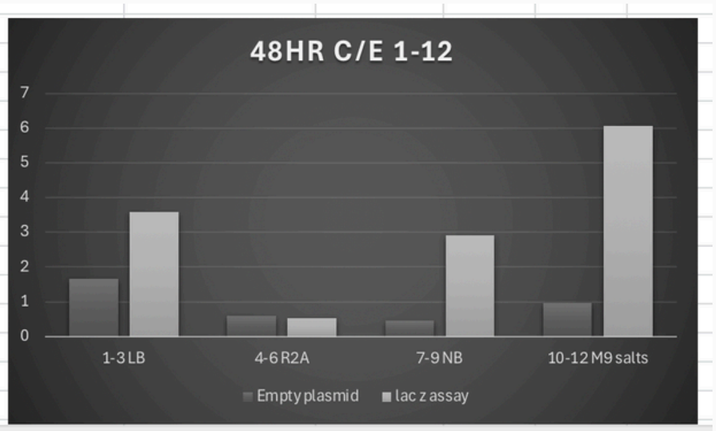
Sample	Abs 600	Act abs 600	RXN Srt (min)	RXN end (min)	RXN time mean	Abs 420	Miller units	Miller mean units	STRD DIV
24) c1	0.071	0.852	1.0	1394	1393.0	0.079	0.665635353	0.458046698	0.179892526
24) c2	0.068	0.816	1.0	1394	1393.0	0.041	0.360697043	0.458046698	0.179892526
24) c3	0.086	1.032	1.0	1394	1393.0	0.050	0.347807699	0.458046698	0.179892526
24) c4	0.017	0.204	1.0	1394	1393.0	0.031	1.090888617	1.077480779	0.369587095
24) c5	0.029	0.348	1.0	1394	1393.0	0.034	0.701372214	1.077480779	0.369587095
24) c6	0.027	0.324	1.0	1394	1393.0	0.065	1.440181507	1.077480779	0.369587095
24) c7	0.039	0.468	1.0	1394	1393.0	0.047	0.720942932	0.828254858	0.175675079
24) c8	0.040	0.480	1.0	1394	1393.0	0.049	0.732830821	0.828254858	0.175675079
24) c9	0.047	0.564	1.0	1394	1393.0	0.081	1.03099082	0.828254858	0.175675079
24) c10	0.049	0.588	1.0	1394	1393.0	0.086	1.049953363	0.890422181	0.223444980
24) c11	0.065	0.780	1.0	1394	1393.0	0.069	0.635043349	0.890422181	0.223444980
24) c12	0.037	0.444	1.0	1394	1393.0	0.061	0.98626983	0.890422181	0.223444980
24) E1	0.084	1.008	3.0	1398	1395.0	0.122	0.867611083	1.15820572	0.510677433
24) E2	0.081	0.972	3.0	1398	1395.0	0.237	1.74786495	1.15820572	0.510677433
24) E3	0.089	1.068	3.0	1398	1395.0	0.128	0.859141127	1.15820572	0.510677433
24) E4	0.030	0.360	3.0	1398	1395.0	0.065	1.294305058	0.860362553	0.375809401
24) E5	0.075	0.900	3.0	1398	1395.0	0.081	0.64516129	0.860362553	0.375809401
24) E6	0.054	0.648	3.0	1398	1395.0	0.058	0.641621311	0.860362553	0.375809401
24) E7	0.076	0.912	3.0	1398	1395.0	0.123	0.966798717	1.566486526	0.522243362
24) E8	0.037	0.444	3.0	1398	1395.0	0.119	1.921276115	1.566486526	0.522243362
24) E9	0.031	0.372	3.0	1398	1395.0	0.094	1.811384746	1.566486526	0.522243362
24) E10	0.054	0.648	3.0	1398	1395.0	0.102	1.128368512	2.192038532	1.437624475
24) E11	0.027	0.324	3.0	1398	1395.0	0.173	3.827602991	2.192038532	1.437624475
24) E12	0.066	0.792	3.0	1398	1395.0	0.179	1.620144093	2.192038532	1.437624475
48) C1	0.087	1.044	93.5	1401	1307.5	0.266	1.948675121	1.663876351	0.373650514
48) C2	0.087	1.044	93.5	1401	1307.5	0.246	1.802158194	1.663876351	0.373650514
48) C3	0.094	1.128	93.5	1401	1307.5	0.183	1.240795737	1.663876351	0.373650514
48) C4	0.061	0.732	93.5	1401	1307.5	0.047	0.491071895	0.591348803	0.198019455
48) C5	0.066	0.792	93.5	1401	1307.5	0.048	0.463526276	0.591348803	0.198019455
48) C6	0.035	0.420	93.5	1401	1307.5	0.045	0.819448238	0.591348803	0.198019455
48) C7	0.067	0.804	93.5	1401	1307.5	0.047	0.447095307	0.463967324	0.022533732
48) C8	0.070	0.840	93.5	1401	1307.5	0.050	0.455249021	0.463967324	0.022533732
48) C9	0.069	0.828	93.5	1401	1307.5	0.053	0.489557643	0.463967324	0.022533732
48) C10	0.082	0.984	93.5	1401	1307.5	0.151	1.173654184	0.952623189	0.197478494
48) C11	0.078	0.936	93.5	1401	1307.5	0.109	0.890653854	0.952623189	0.197478494
48) C12	0.102	1.224	93.5	1401	1307.5	0.127	0.793561529	0.952623189	0.197478494
48) E1	0.093	1.116	97.0	1406	1309.0	0.753	5.15455449	3.577226618	1.372109119
48) E2	0.108	1.296	97.0	1406	1309.0	0.495	2.9178338	3.577226618	1.372109119
48) E3	0.079	0.948	97.0	1406	1309.0	0.330	2.659291565	3.577226618	1.372109119
48) E4	0.067	0.804	97.0	1406	1309.0	0.047	0.446582975	0.519973984	0.155906124
48) E5	0.051	0.612	97.0	1406	1309.0	0.056	0.699031841	0.519973984	0.155906124
48) E6	0.063	0.756	97.0	1406	1309.0	0.041	0.414307137	0.519973984	0.155906124
48) E7	0.057	0.684	97.0	1406	1309.0	0.299	3.339453804	2.913953664	0.847926393
48) E8	0.061	0.732	97.0	1406	1309.0	0.332	3.464873282	2.913953664	0.847926393
48) E9	0.069	0.828	97.0	1406	1309.0	0.210	1.937533907	2.913953664	0.847926393
48) E10	0.072	0.864	97.0	1406	1309.0	0.974	8.612030671	6.058897015	3.128089222
48) E11	0.082	0.984	97.0	1406	1309.0	0.901	6.995037483	6.058897015	3.128089222
48) E12	0.055	0.660	97.0	1406	1309.0	0.222	2.56962289	6.058897015	3.128089222

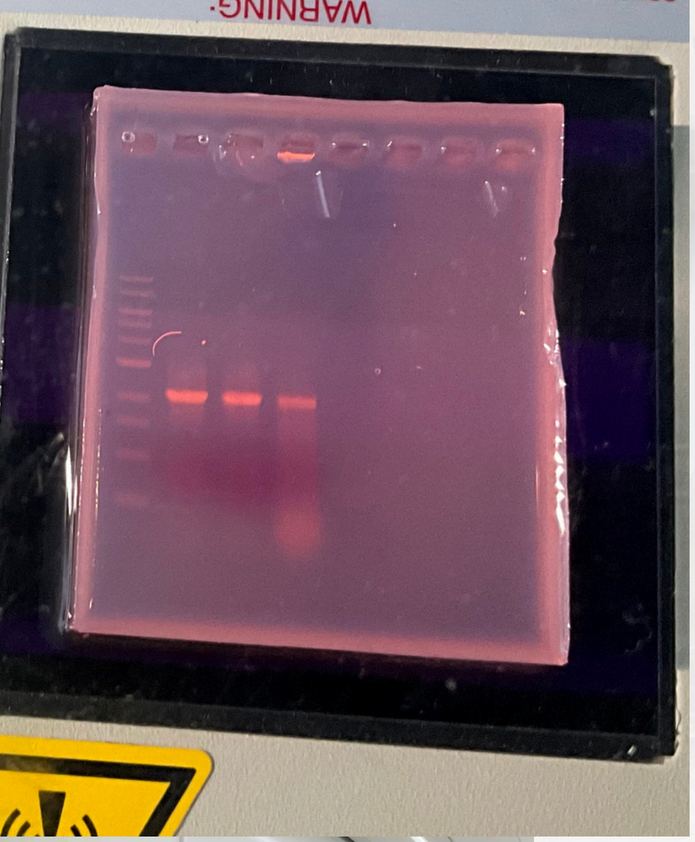
Sheet1 Sheet2 +

24 hr) C/E	Empty plasmid	lac z assay	STDEV E-plasmid	STDEV lacZ
1-3 LB	0.458046698	1.15820572	0.179892526	0.510677433
4-6 R2A	1.077480779	0.860362553	0.369587095	0.37580940
7-9 NB	0.828254858	1.566486526	0.175675079	0.522243362
10-12 M9 salts	0.890422181	2.192038532	0.223444980	1.437624475



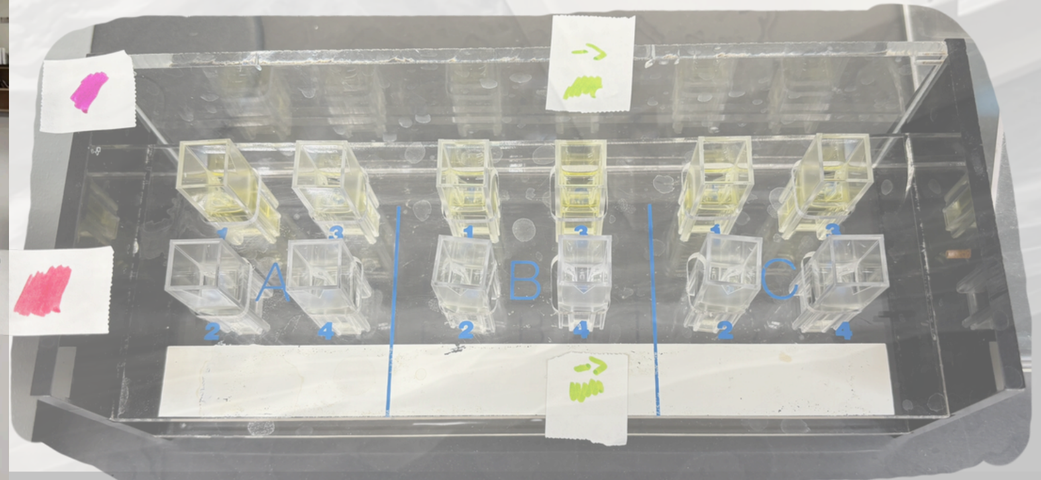
48 hr) C/E	Empty plasmid	lac z assay	STDEV E-plasmid	STDEV lacZ
1-3 LB	1.663876351	3.577226618	0.373650514	1.372109119
4-6 R2A	0.591348803	0.519973984	0.198019455	0.155906124
7-9 NB	0.463967324	2.913953664	0.022533732	0.847926393
10-12 M9 salts	0.952623189	6.058897015	0.197478494	3.128089222





LIMITATIONS

LIMITATIONS THAT WERE PRESENT
- LIMITED TIME I HAD WITH THIS SUMMER PROJECT
-MY KNOWLEDGE OF TERMINOLOGY WAS LIMITED WHEN STARTING A MICROBIOLOGY PROJECT.
- BEING TRANSPARENT ON % ERROR



WHATS NEXT ?

FALL 2024

BIOFILM ANALYSIS

LAC ASSAYS ON 4 MORE N-SOURCES

PUBLISH AND CREATE A POSTER

ASM CONFERENCE

ACKNOWLEDGMENTS

REFERENCES

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