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Ohio Wesleyan Bacillus Collection Student Research

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Presenter Information

Madeline Russell, Nandini Arora, Emily Bode, Morgan Chmielenski, Rebecca Coppenbarger, Ginny Faeth, Carianne Hutchison, Mindi Klaus, Jonna Mendenhall, Natalia Molotievskiy, Jess Nichols, Jennifer Paul, Brynn Schlesinger, Olivia Smith, Myles Steed, Abby Thierauf, and Ivan Vore

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BIOL 328: Bacterial Physiology

Dr. Laura Tuhela-Reuning
Maddy Russell, Teaching Laboratory Assistant

An Introduction

- What is Bacterial Physiology?
  - The study of the functionality and life-process that keep bacteria alive
- What was the goal for students this semester?
  - Individually planned and executed research projects involving the OWU *Bacillus* Collection
- What is the *Bacillus* Collection?
  - An independent research project run by current and former faculty analyzing feather degrading bacteria isolated from songbird feathers across three states.

About me:

- Senior Microbiology Student
- Laboratory Teaching Assistant and Research Mentor

Chief of *Staphs*

Mindi Klaus, Natalia Molotievskiy, Brynn Schlesinger, Abby Thierauf

Research Question:

What is the relationship between feather degradation and biofilm formation in bacteria?

Experiments:

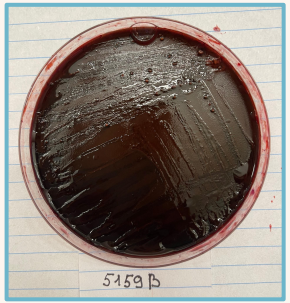
1. Screening of efficient feather-degrading strains
2. Screening of bacterial isolates for their ability to form biofilms
3. Quantitative analyze of feather degradation ability
4. Scanning Electron Microscopy analysis

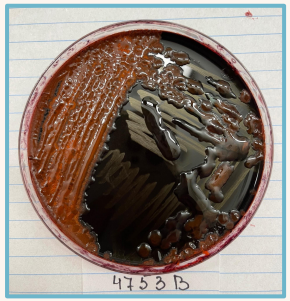
How did they address your question?

-We screened originally to find the best feather degraders and biofilm formers, and then subsequent experiments tested how feather degradation and biofilm formation influence one another

Chief of *Staphs*

Results





Conclusions:

- 5/10 strains showed substantial feather degradation
- 2/10 strains showed positive Biofilm formation ability
- 5154B was the overall best feather degrader!
- Biofilm data is still being collected, As well as the results from the dual inoculated flask

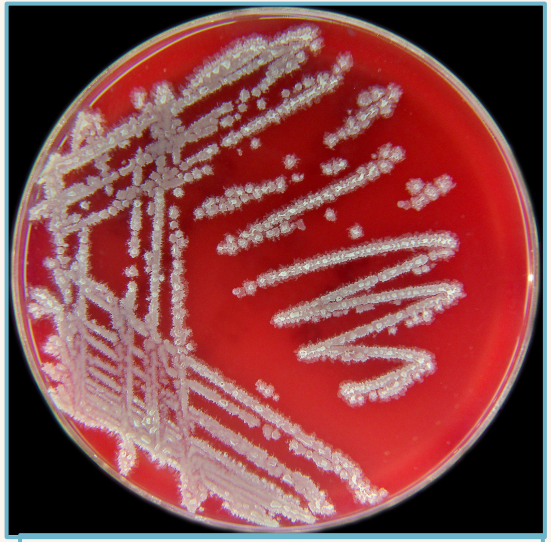
	1	2	3	4	5	6	7	8	9
A	0.735	0.770	0.737	0.718	0.836	0.970	1.026	0.563	1.353
B	0.727	0.738	0.777	1.082	1.390	1.561	1.701	1.689	1.836
C	0.707	0.643	0.715	0.727	0.738	0.755	0.767	0.755	0.764
D	0.716	0.653	0.690	0.671	0.684	0.727	0.745	0.695	0.813
E	0.732	1.060	0.921	0.998	1.152	1.149	1.176	0.968	1.304
F	0.696	0.718	0.687	0.708	0.732	0.743	0.760	0.702	0.837
G	0.363	0.359	0.369	0.362	0.360	0.371	0.358	0.363	0.388

Biochemical Warfare Agents

Myles Steed, Jennifer Paul, Carianne Hutchison, & Rebecca Coppenbarger

Research Question: What feather bacterial isolates in the OWU Bacillus collection produce β-keratinase and what is their identity?

https://www.forbes.com/sites/neilyeoh/2018/05/17/startup-waste-feathers-sustainable-packaging/?sh=2f6038ce2dfb



https://en.wikipedia.org/wiki/Bacillus_licheniformis

Biochemical Warfare Agents

Myles Steed, Jennifer Paul, Carianne Hutchison, & Rebecca Coppenbarger

Experimental Design:

- Isolated 7 bacteria from OWU *Bacillus* collection
- Isolated samples were screened for β-keratinase through:
  - Incolulating isolates in feather medium
  - Taking a sample of media every 12 hours
  - Centrifuging media samples to separate bacteria residue from feathers and further analyzing the residue
- Samples were run through a spectrophotometer to determine if there was any β-keratinase activity
  - Specifically were determining if there were any oligopeptides produced

Biochemical Warfare Agents

Myles Steed, Jennifer Paul, Carianne Hutchison, & Rebecca Coppenbarger

Results:

- For our first set of data, 5 of the 7 isolates had significant oligopeptide production

- We are in the process of analyzing our second set of data of the same isolates

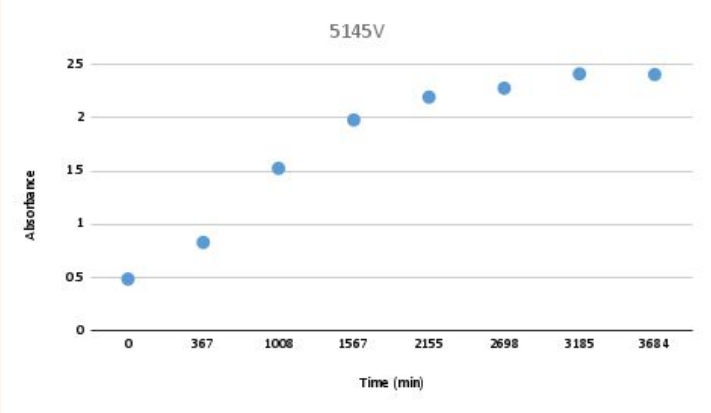


Fig 1. Oligopeptide light absorbance in 5145V isolated strain

Conclusions

- We cannot make any final conclusions yet; however, it is likely that 5 of our 7 isolates produce β-keratinase

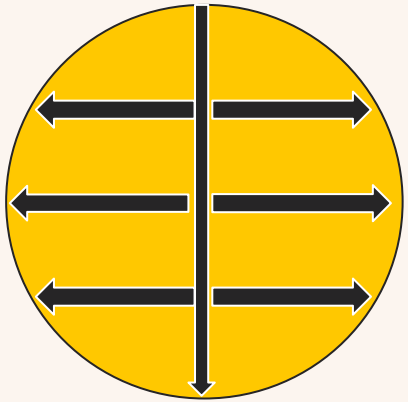
Team AUGUR Research Project

Ivan Vore, Nandini Arora, Jonna Mendenhall, Ginny Faeth

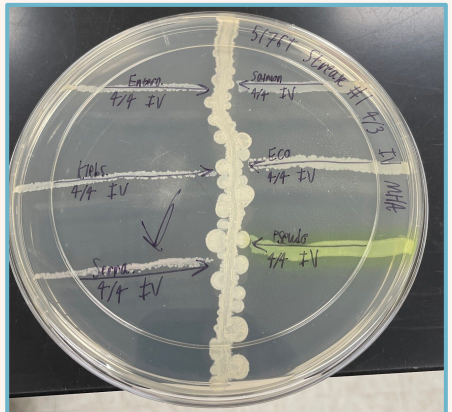
- **Research Question:** do *Bacillus spp.* produce antibiotics?
  - Hypothesis: *Bacillus spp.* Produce antibiotics in the presence of competing microbes.

- **Method: Cross Streaking** - a qualitative testing for antibiotic activity, measuring **zones of inhibition (ZOI)**, indicating antibiotic production.

Model

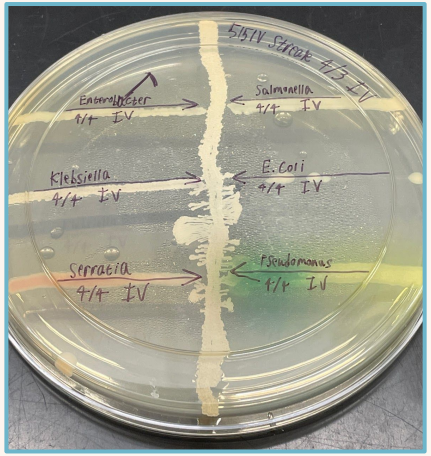


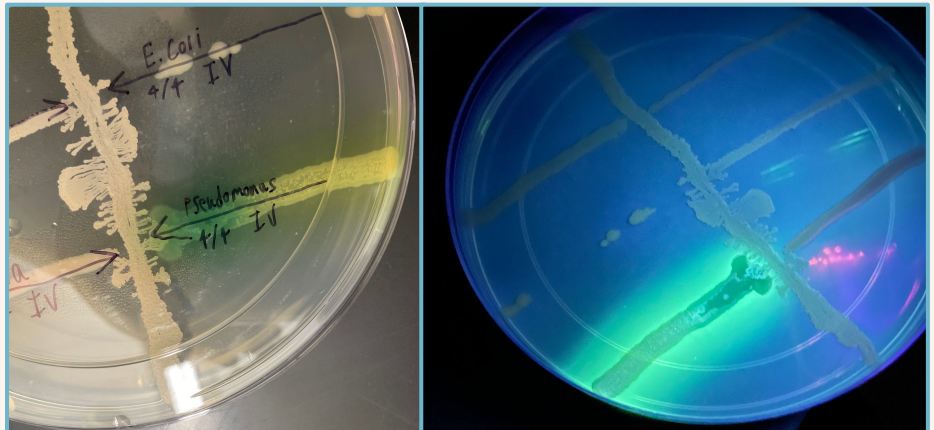
In practice



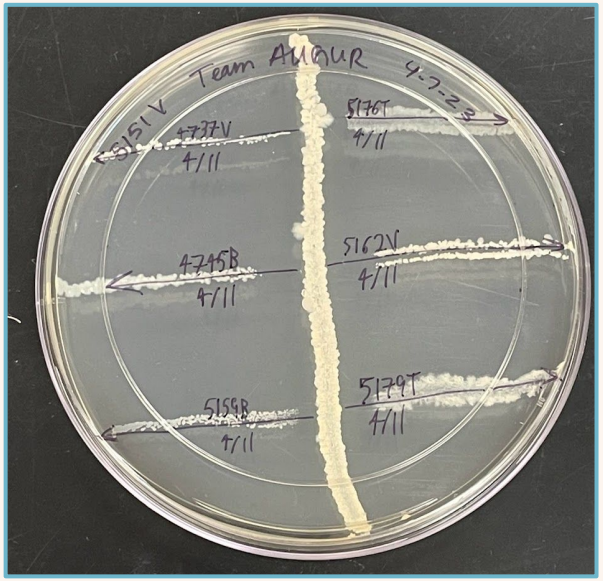
Results

Bacillus spp. vs. Gram Negatives





Bacillus spp. vs. *Bacillus spp.*



Team Ur Mom

Emily Bode, Olivia Smith, Jess Nichols, and Morgan Chmielenski

Our Research Question:

"Are plasmids, like 5KfuGFR and tsPurple5K able to be inserted into gram positive bacteria, specifically the unknown *Bacillus* species isolated from birds."

Our Experiments:

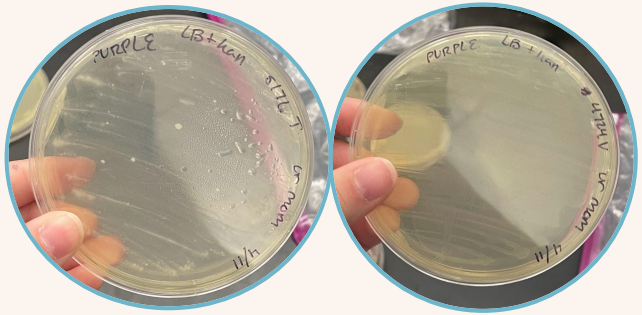
- Streaked 6 species of *Bacillus* onto slants
- Growth curve with spectrometer
- Plasmids were screened in unknown species
- Plasmid of interest were inserted into bacillus and transformed using a modified protoplast procedure

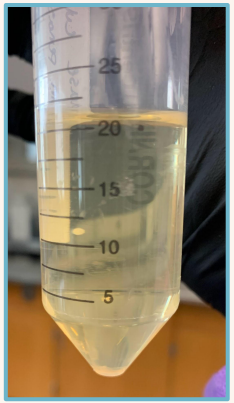
Team Ur Mom

Emily Bode, Olivia Smith, Jess Nichols, and Morgan Chmielenski

Results

- Plasmid Extraction - *Bacillus*
  - No liquid
- Plasmid Extraction - *E. coli*
  - Successful
- Protoplasts
  - Successful
- Plating on Antibiotic plates
  - Purple = growth
  - pGlow = no growth





Conclusion

- Conjugation = successful

Thanks

Do you have any questions?

Special thanks to Melinda Endres, Kiley Lewin, and Kayce Tomcho for lab prep, experimental consultation, and emotional support!

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