2013 Summer Internship

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Mentor- Dr. Mark Ott
Environmental Microbiology Lab

Overview

- Background
- Projects
  - Examining the OmniLog Identification System
  - Evaluating the Cole-Parmer Bacterial GrowthTest Kit
- Tours/ SLSSI
- Future Plans

Background

- Junior at Auburn University
  - Microbiology/ Pre-Vet
- Southeastern Raptor Center
  - Previously worked at an Animal Hospital

Objectives of Internship

- To learn about human spaceflight and how NASA operates
- To acquire sound lab techniques
- To study microorganisms, particularly in relation to humans and spaceflight

Biolog's OmniLog

- Overview
  - Bacterial/ Fungal Identification System
  - Quick and easy to use

- Goals
  - Is it reliable enough to identify organisms from the ISS? – specifically Gram-negative rods from water samples
    - *Ralstonia pickettii, Burkholderia multivorans, Sphingomonas sanguinis,* etc
  - Which protocol is the most effective?

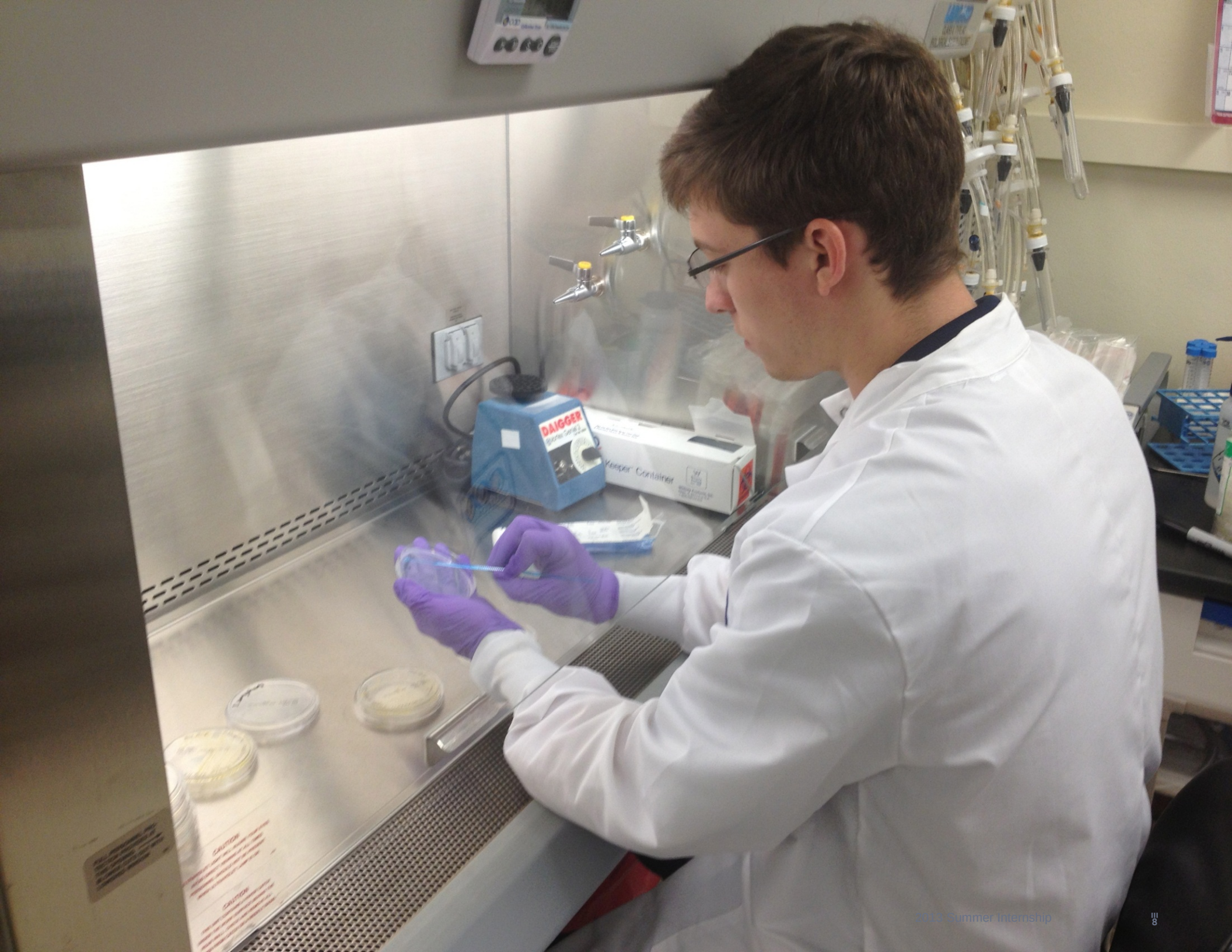
Procedure

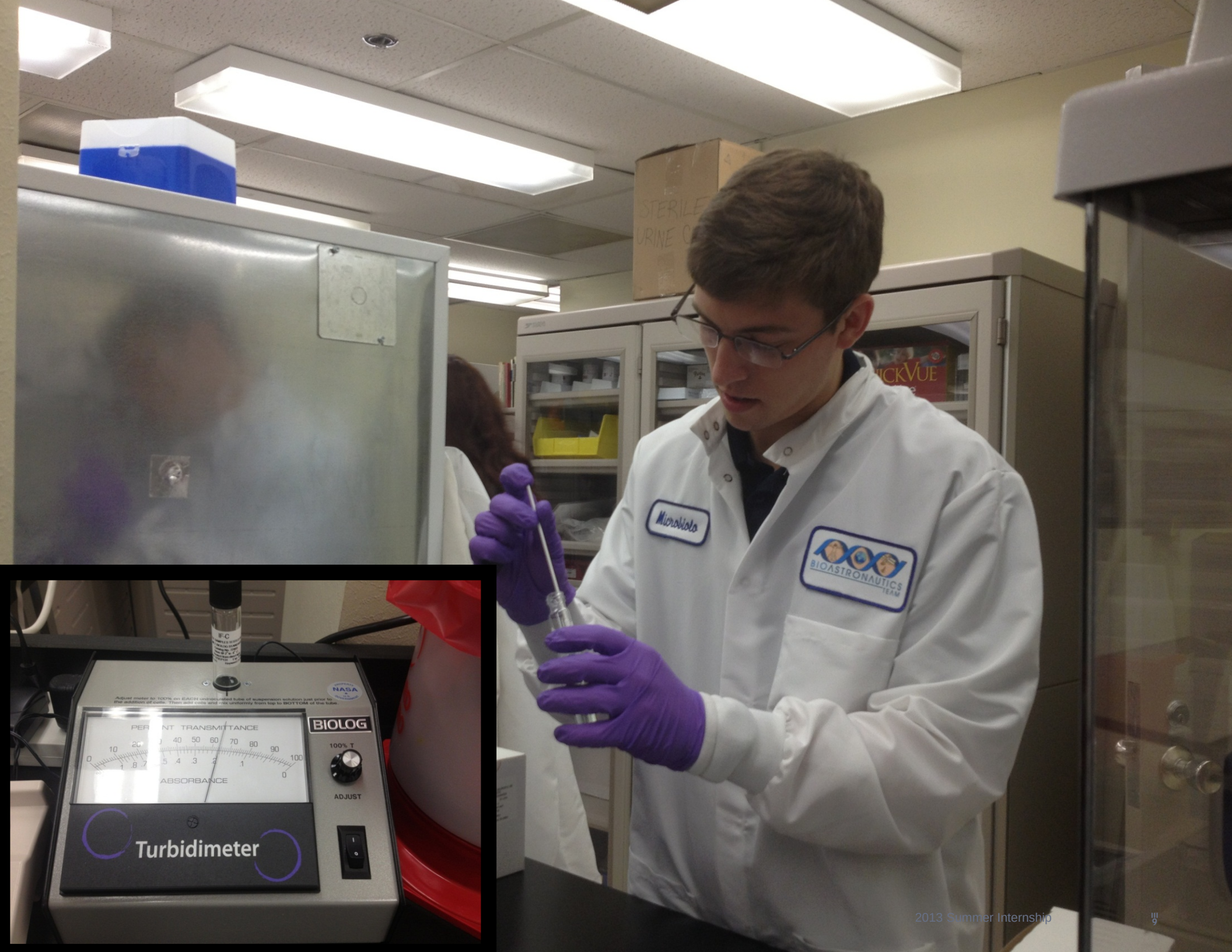
Streak the organism on an R2A plate- incubate for 48 hours

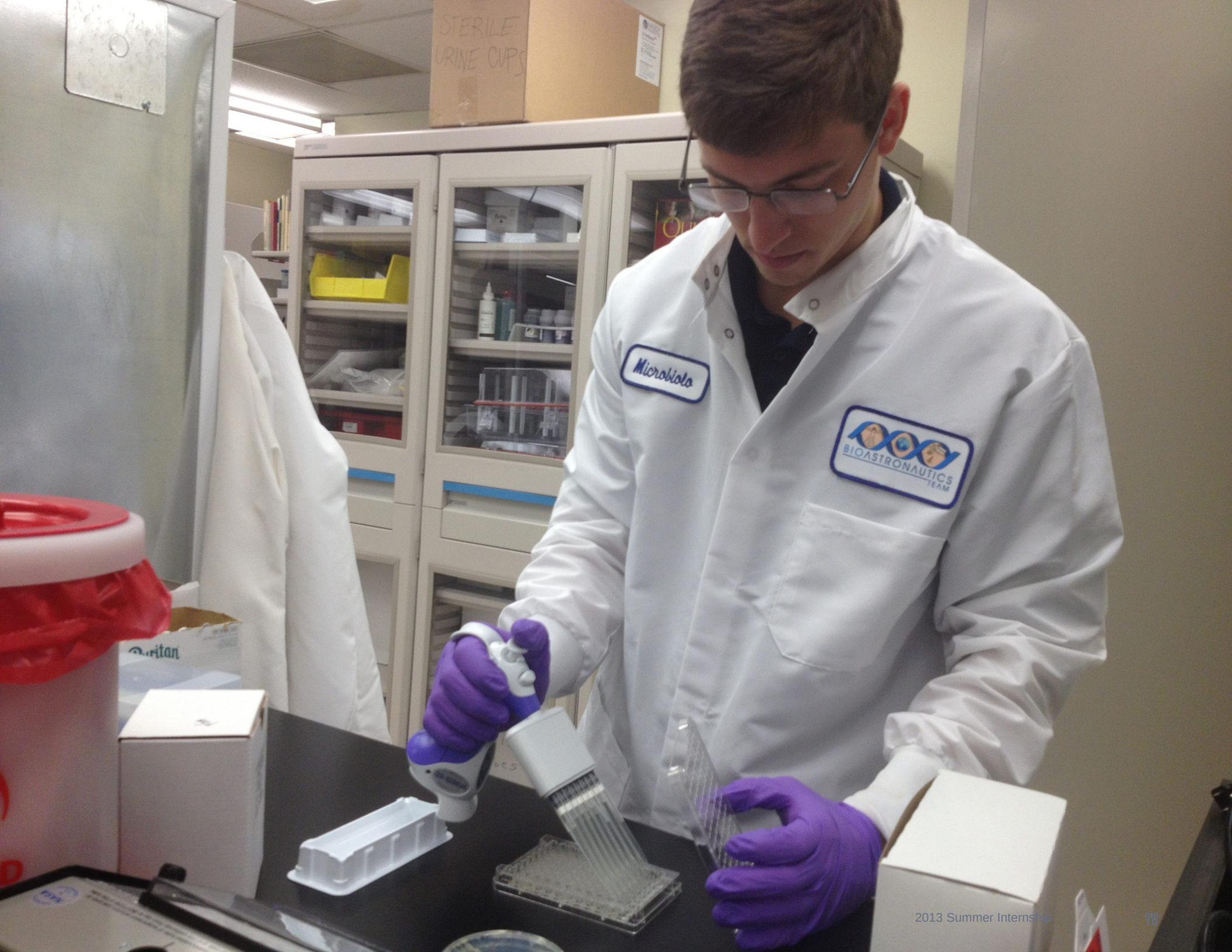
Inoculate fluid (C2 or A) with organism to the appropriate turbidity

Dispense the fluid in a well plate

Load the well plate onto the Biolog

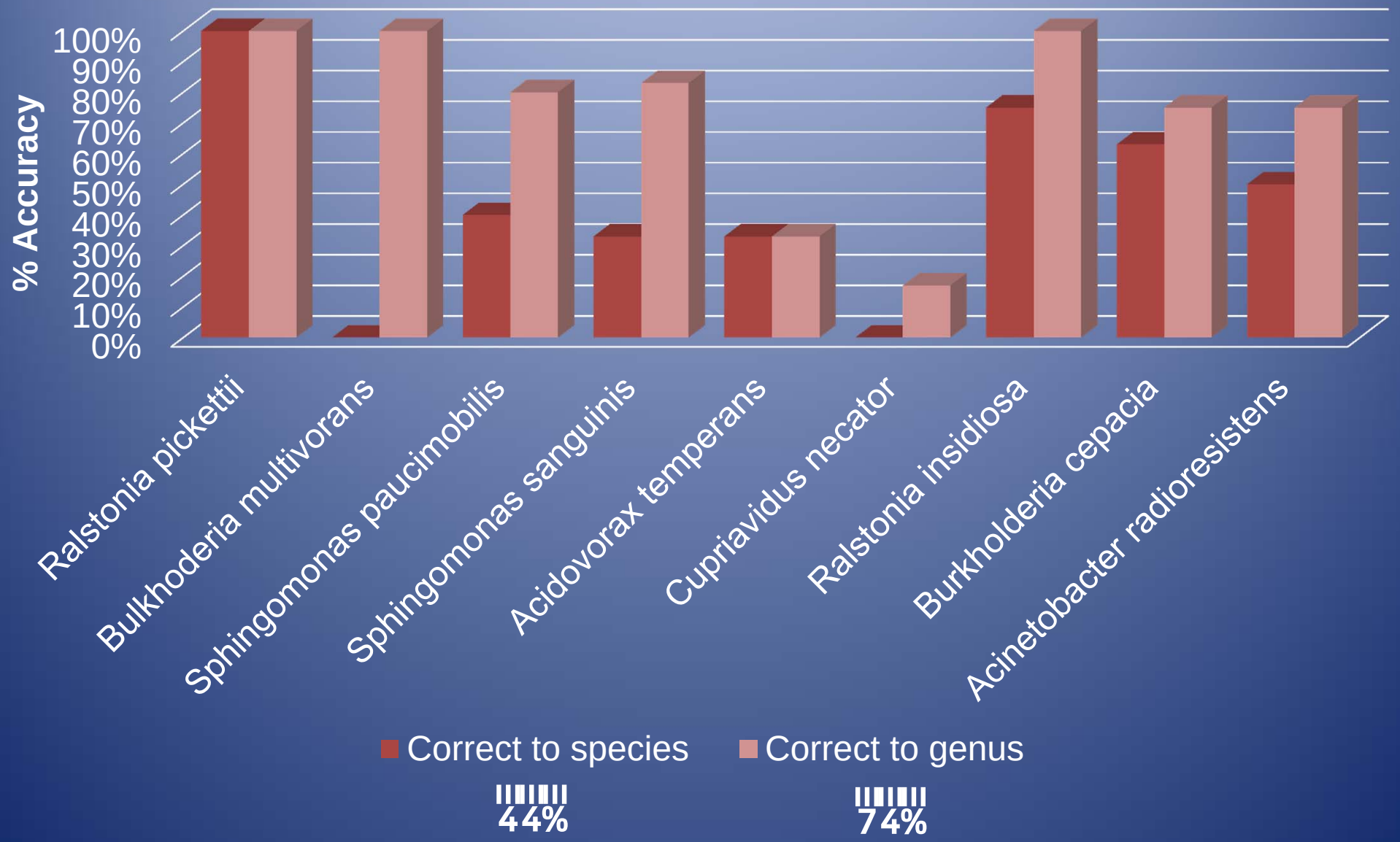

DAIGGER
Keeper Container


Microbiota
BIOASTRONAUTICS TEAM
BIOLOG
PERCENT TRANSMITTANCE
ABSORBANCE
100% T
ADJUST
Turbidimeter


STERILE
URINE CUPS
Microbiolo
BIOASTRONAUTICS
TEAM

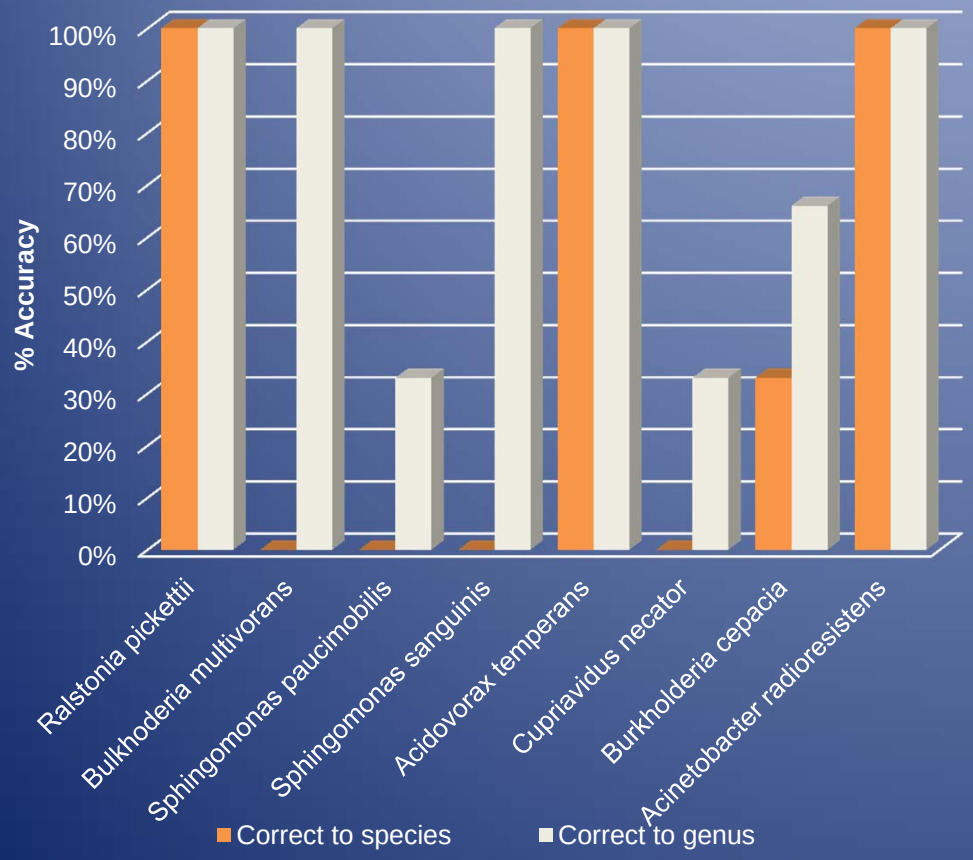
Procedure

Total Accuracy



Comparison of Protocols

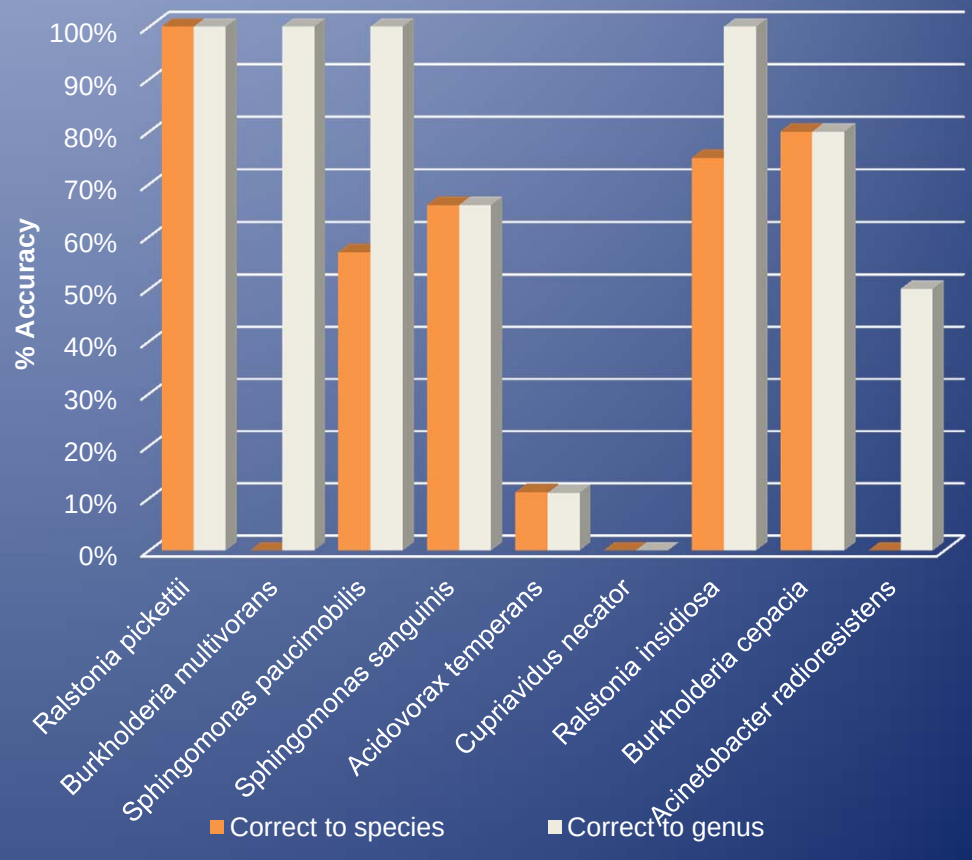
Protocol A



42%

79%

Protocol C2



43%

67%

Future plans for the Biolog

- Currently inconsistent, but shows promise
- Further research is required
  - Different media, incubation temperatures, protocols, etc.
- Improvements to the system are necessary for the Biolog to be reliable enough to use

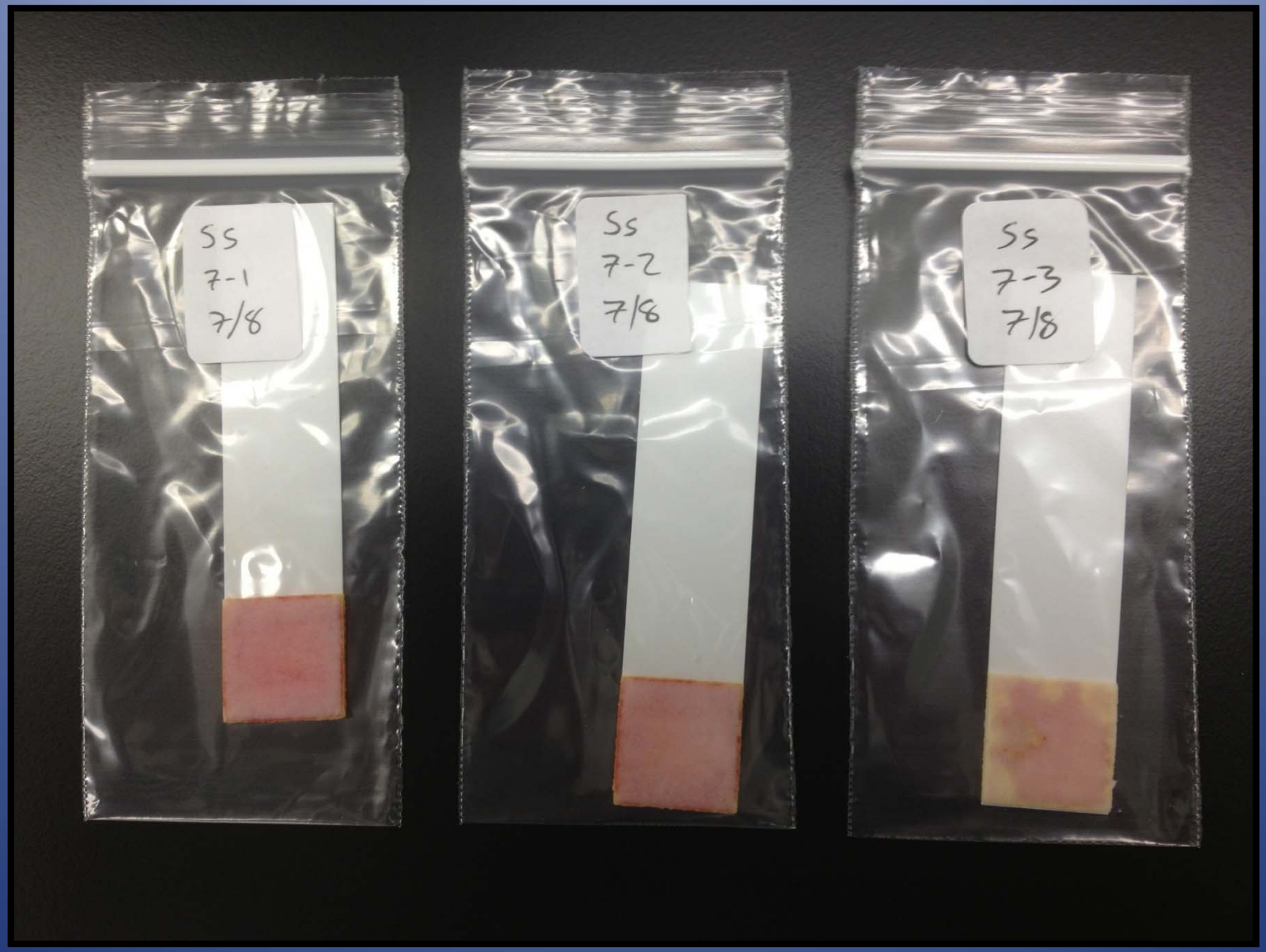
Cole –Parmer Bacterial Growth Test Kit

New technology is necessary for our trip to Mars

Test strips show potential

- Simple
- Lightweight
- Long-lasting

- But are the strips effective?

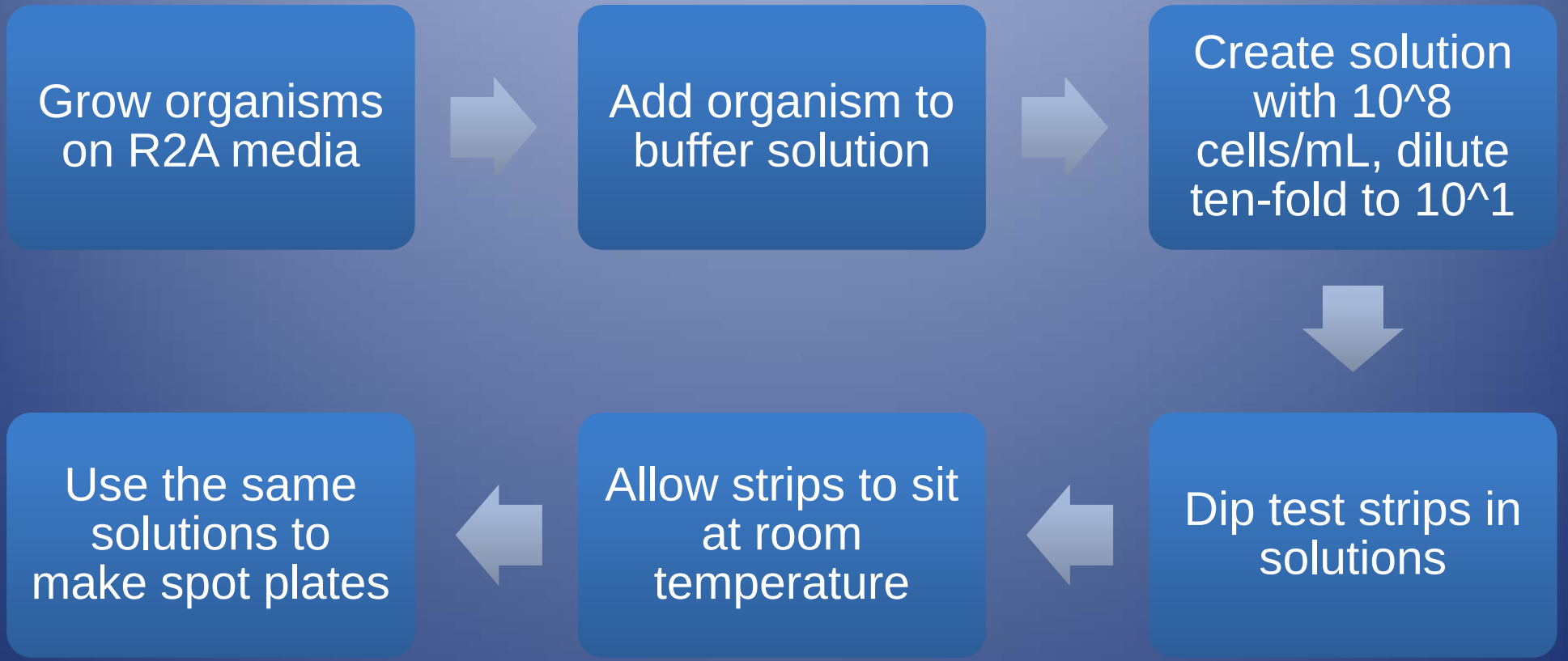

SS
7-1
7/8
SS
7-2
7/8
SS
7-3
7/8

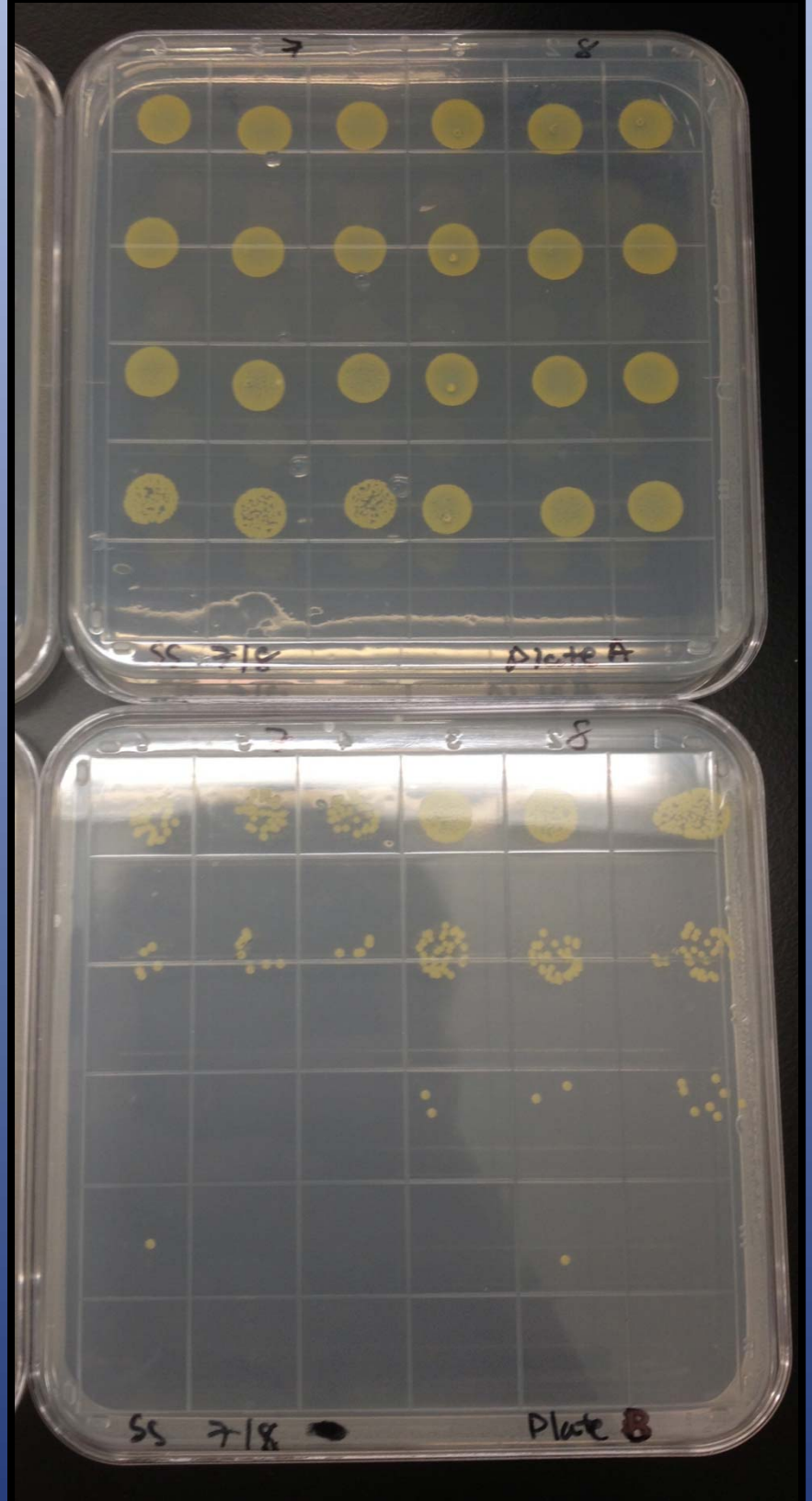
Procedure

- Use known concentrations to test the accuracy of the test strips
- Try different organisms separately and together to see how the test strips react to each

- Do the results vary between species?
- Are the results reproducible?
- Are the results accurate?

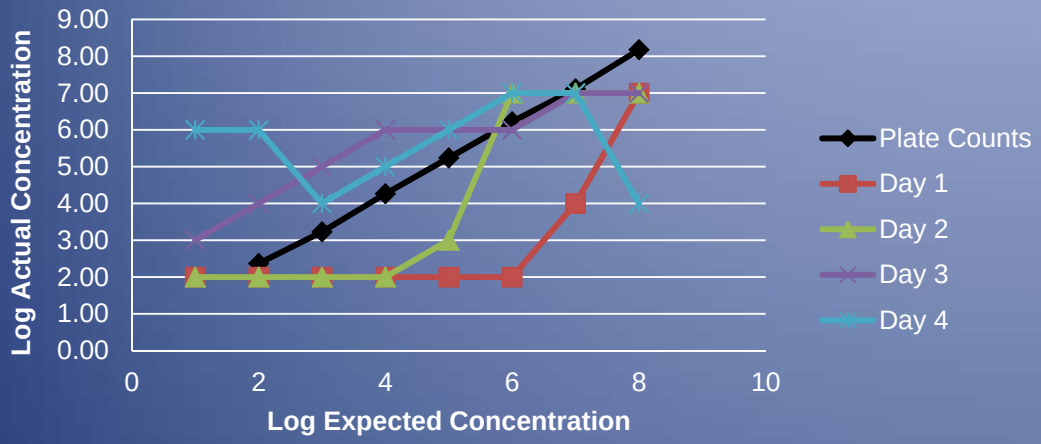
Procedure


Grow organisms on R2A media
Add organism to buffer solution
Create solution with 10^8 cells/mL, dilute ten-fold to 10^1
Dip test strips in solutions
Allow strips to sit at room temperature
Use the same solutions to make spot plates

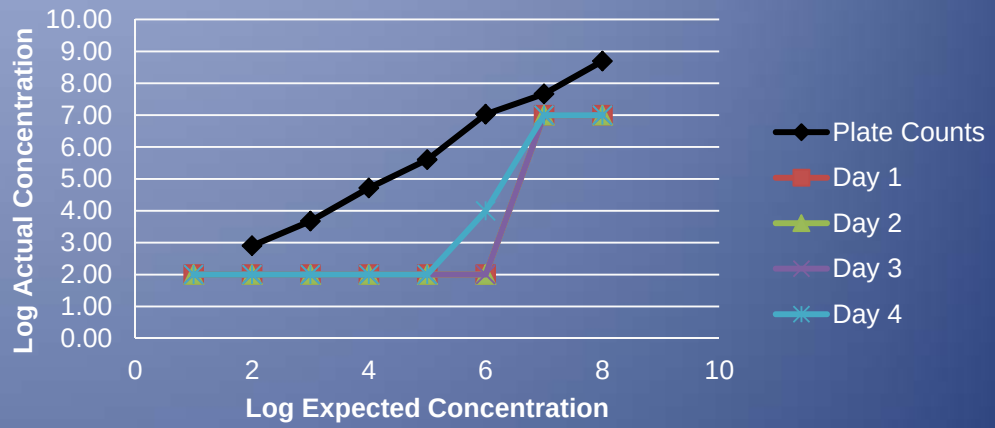

7
8
SS 7/8
Plate A
7
8
SS 7/8
Plate B

Results

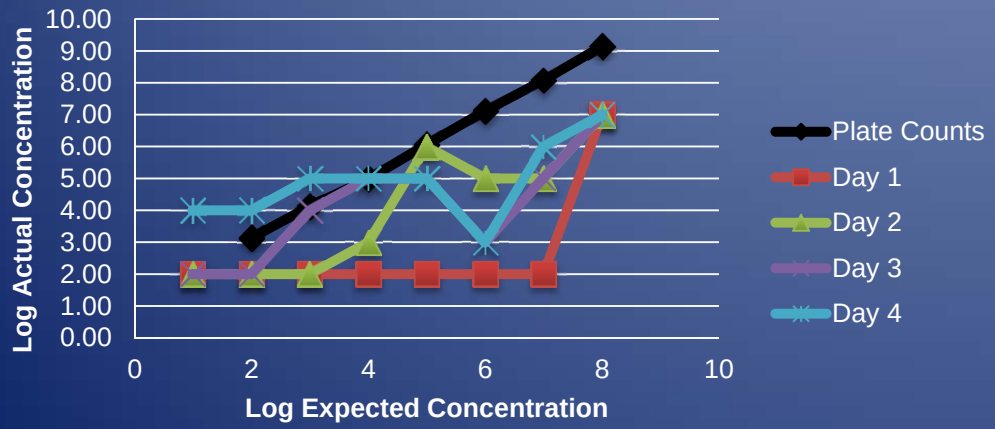
Burkholderia multivorans



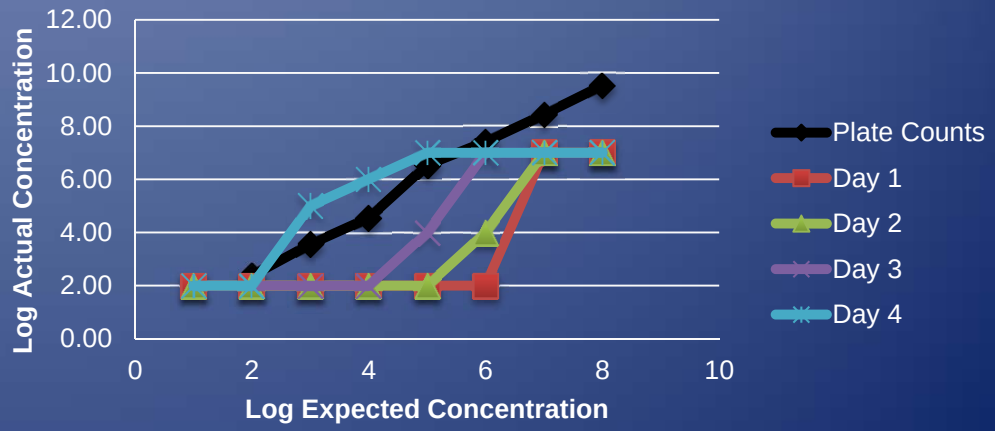
Ralstonia pickettii



Cupriavidus metallidurans

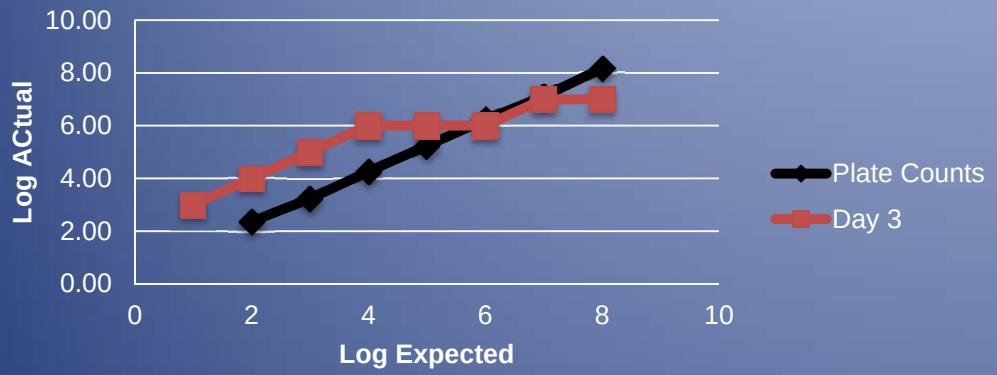


Sphingomonas sanguinis

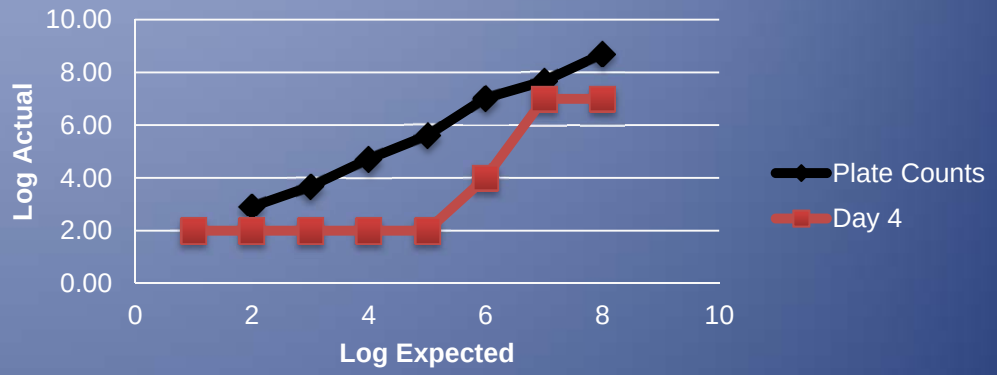


Results

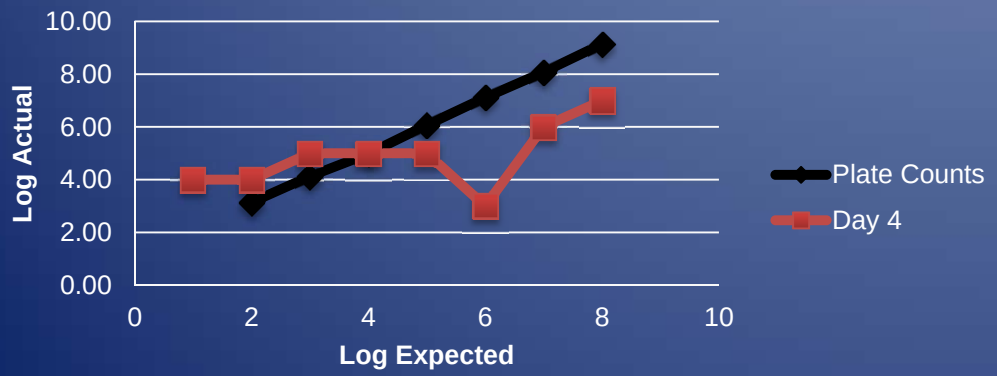
B. multivorans
Day 3 vs. Plate counts



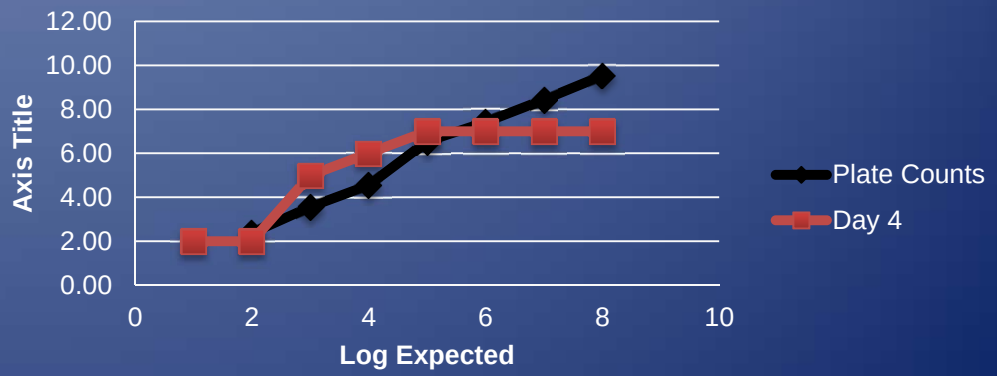
Ralstonia pickettii
Day 4 vs. Plate Counts



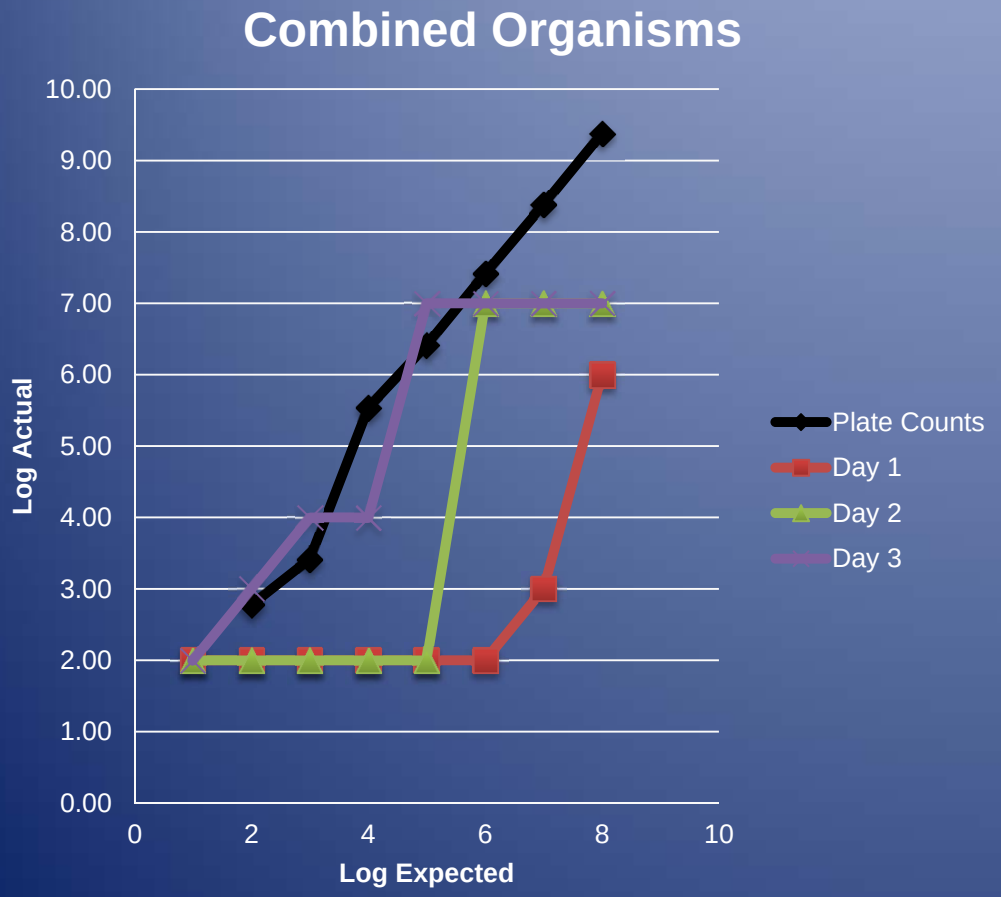
Cupriavidus metallidurans
Day 4 vs. Plate Counts

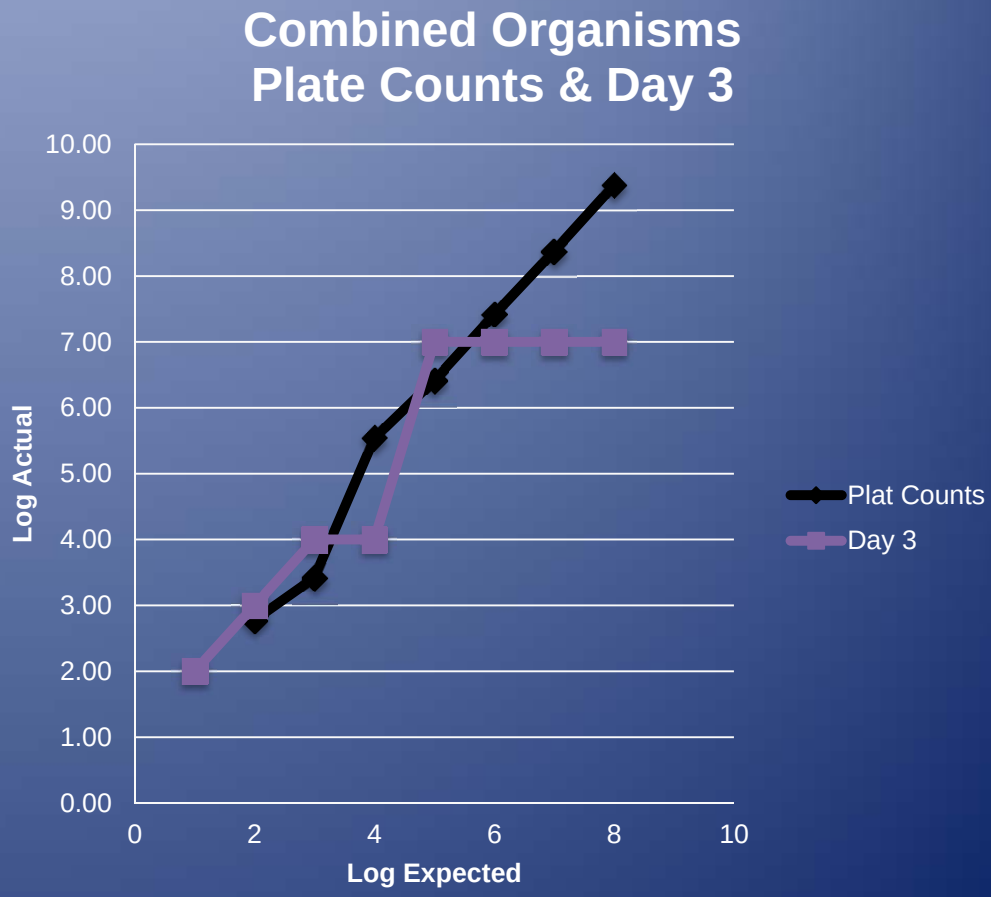


Sphingomonas sanguinis
Day 4 vs. Plate Counts



Results


Combined Organisms
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Log Actual
0
2
4
6
8
10
Log Expected
Plate Counts
Day 1
Day 2
Day 3


Combined Organisms
Plate Counts & Day 3
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Log Actual
0
2
4
6
8
10
Log Expected
Plat Counts
Day 3

Evaluation

- Improve the scale
- Make the concentrations more easily identifiable
  - Different colors, fluorescent
- Not the most precise enumeration method, but is sufficient for spaceflight

Plans for Future, short term

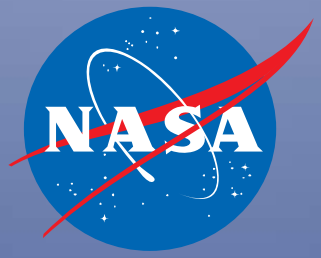
- Raptor center, research at school
- Grad school
  - Epidemiology
  - Virology
  - Astrobiology
  - Space Studies

Plans for future, long term

- NASA, CDC, DoD, Hudson Alpha
  - Cutting edge research
- ASTRONAUT
- Research Leader

Thanks!

- Dr. Ott
- Dr. Pierson
- Dr. Botkin
- Dr. Merkle
- Judy Hayes
- Melanie Smith
- Airan Yoets
- Jan Connolly
- And everyone else that helped make this a great summer


NASA