Calculating the Minimum Inhibitory Concentration (MIC) of Gentamycin on *Staphylococcus epidermidis* Grown Under Simulated Microgravity

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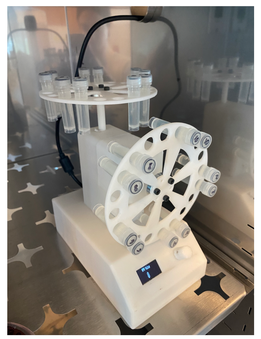
Introduction

- With space travel becoming more prominent, scientists have been searching for ways to allow for a thriving environment while on long-duration space missions.
- One of the ways researchers are investigating ways to maintain optimal health in astronauts is through antibiotic resistance.
- An astronaut's immune system functions differently in microgravity than it does on Earth due to metabolic changes.
- Therefore, a certain dosage of an antibiotic may used to treat a certain infection may be affected in these conditions.
- This study aims to determine the MIC (minimum inhibitory concentration) of Gentamicin and measure its effect on S. epidermidis under simulated microgravity.

Experimental Design

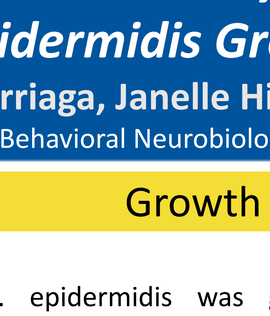
- S. epidermidis was cultured from glycerol stocks for short term exposure experiments.
- S. epidermidis was cultured in Nutrient Broth (NB) media overnight.
- These cultures were then grown in epitubes on the EAGLESTAT within different antibiotic concentrations.



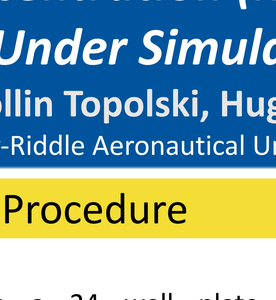
- After growth occurred, the cultures were transferred to a 94-well plate and their optical density was analyzed. Drop plates were also made to count colonies.
- Data from this growth was analyzed and used to decide which antibiotic concentration was significant enough to use for the growth curve.

Growth Curve Procedure

- S. epidermidis was grown in a 24 well plate with concentrations of Gentamicin ranging from 0.5 to 0.126 µg/ml.
- Plate was placed on a shaker and incubated at 30°C.
- Absorbance was read on a spectrophotometer to observe the changes in biomass over a period of 8 hours.
- Dilutions were made to measure numbers of colonies at a countable quantity that were able to grow after being exposed to the antibiotic and microgravity.
- Colony-forming units were obtained by counting the number of colonies that were grown on the plates.



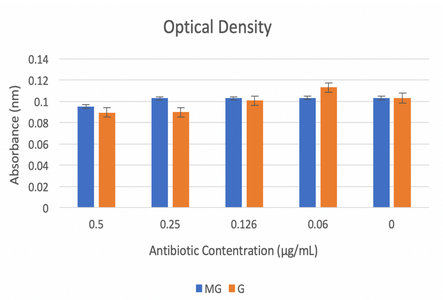
Colony-Forming Units: 0.126 µg/mL (Microgravity) 24 Hrs



Colony-Forming Units: 0.126 µg/mL (Gravity) 24 Hrs

Optical Density

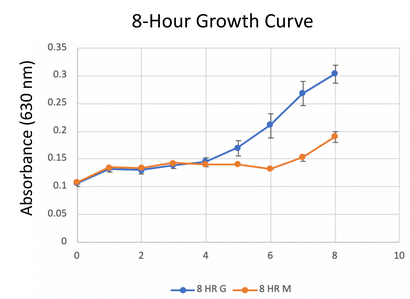
- S. epidermidis was grown in 2 mL epitubes on the EAGLESTAT and incubated for 30 hours.
- Epitubes had range of antibiotic concentrations.

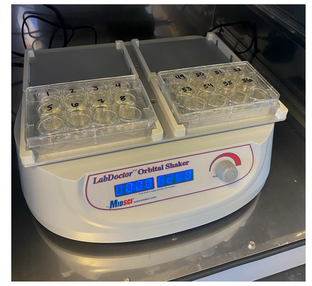


- After the 30-hr incubation period, absorbance was read at 630 nm on the spectrophotometer to determine biomass.

Growth Curve

- Samples were collected to test their viability at hourly time points.
- These samples were incubated for 8 hours and their absorbance was measured every hour.
- Results indicate a major difference between the two time points, with gravity being more viable at 8 hours and microgravity being more viable at 24 hours.





Future Research

- Expand screening of antibiotics and their concentrations.
- Expand the time period of the growth curve.
- Observe growth of post-antibiotic exposure.
- Observe antibiotic mechanisms of action.
- Study changes in gene expression of cultures.

References:

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