



**CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY**

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Project Title
Developing a Novel Antimicrobial Using Contact Lens Solution Preservatives

Abstract

Objectives/Goals
This third year project tested a novel combination of antimicrobial contact lens solution preservatives, Benzyl Alcohol+EDTA+Chlorhexidine gluconate (CHD), for effectiveness against the Gram-negative bacteria MRSA and the Gram-positive Pseudomonas aeruginosa. The goal was to create a novel antimicrobial that was both effective and affordable.

Methods/Materials
This project tested the above preservative combination by performing serial dilutions to find the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC). The preservatives' dilutions started at concentrations similar to what they were in commercial contact lens solutions that contain them. CHD was started around 0.003%, Benzyl Alcohol around 0.5%, and EDTA around 0.5%. The combination columns added these together. The serial dilution was performed: the concentration of the preservatives was cut by half each well down. Bacteria were inoculated into the assay plate wells, and the MICs were determined after incubation.

Results
It was found that the MIC and MBC against both MRSA and Pseudomonas was 0.06769% total amount of preservative (0.03375% Benzyl Alcohol + 0.03375% EDTA + 0.00019% CHD). It was also found that the three preservatives were synergistic against Pseudomonas.

Conclusions/Discussion
It was discovered that Benzyl Alcohol, EDTA, and CHD combined have a synergistic effect against Pseudomonas. Despite no synergy against MRSA, the combination of the three was as effective against it as against Pseudomonas. The novel antimicrobial combination is also cost-effective (\$10 per oz), compared to the expensive but effective CHD (~\$200 per pure oz), or the comparatively ineffective but cheaper EDTA (\$15 per oz) and Benzyl Alcohol (\$4 per oz). This data suggests that using the combination found in this project as the preservative within contact lens solution would result in a solution effective against Gram-negative and Gram-positive bacteria. The preservative combination could also be used in other sanitation settings (e.g. healthcare and hospitals), and would be invaluable as an effective, low-cost antimicrobial in developing countries.

Summary Statement
This project tested the combination of Benzyl alcohol+EDTA+Chlorhexidine gluconate against MRSA and Pseudomonas aeruginosa, and discovered its effectiveness against Gram-negative and Gram-positive bacteria as an affordable antimicrobial.

Help Received
Professor Victor Nizet graciously provided a lab to work in, and Mr. Leo Lin guided me through my experiment. Parents drove me to UCSD to conduct my experiment. Mrs. Elaine Gillum gave me advice on my project.