Antimicrobial Profile of Oral Biofilms: Insights and Implications

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Abstract

Oral biofilms, comprising diverse microbial communities residing on oral surfaces, play a pivotal role in oral health and disease. Understanding the antimicrobial profile of these biofilms is crucial for developing effective strategies to combat oral infections and maintain oral hygiene. Here we report the antimicrobial profile of *Micrococcus lutens*, a bacteria found as part of the mouth microflora. We tested using a comprehensive microtiter inhibition assay with the antibacterial profile using a total of 12 antibacterial agents. Preliminary results indicate that bacteria are susceptible to four agents in a free-living form; however, biofilms (or bacterial communities) are resistant to all of the agents tested. Future studies include the analysis of synergistic interactions between conventional antibiotics and adjunctive therapies provide enhanced efficacy in biofilm eradication.

Introduction

- Microbial biofilms are communities of microorganisms that adhere to surfaces and form a protective matrix of extracellular polymeric substances (EPS).
- Biofilms are resistant to antibiotics and the immune system, making infections difficult to treat and leading to chronic or recurring infections.
- Biofilms can form on medical devices like catheters or implants, causing device-related infections that are challenging to eradicate.
- In natural environments, biofilms can contaminate water sources and industrial equipment, leading to biofouling and corrosion issues.

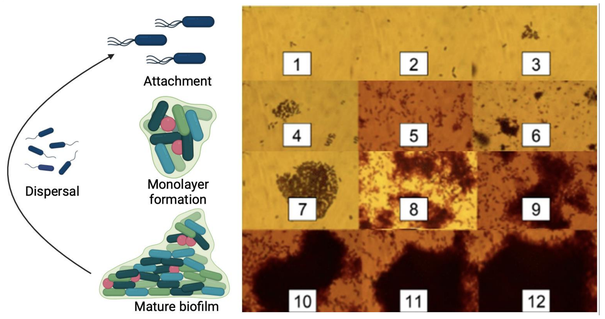


Figure 1. Life history of a microbial Biofilm

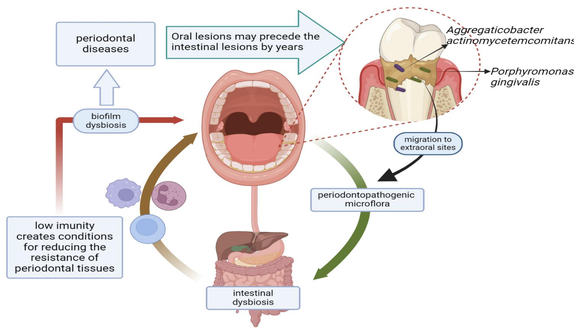
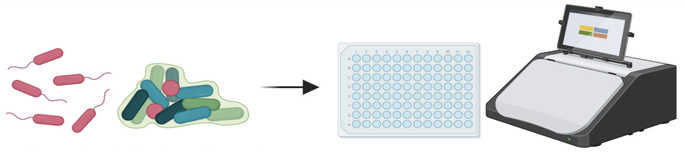


Figure 2. In oral dysbiosis, pathogenic bacteria can dominate the biofilm, increasing the risk of dental caries (cavities), gingivitis, periodontitis, and other oral diseases

Experimental Design and Hypothesis



Hypothesis: Planktonic cells will be more susceptible to antibiotics than their biofilm counterparts.

Results

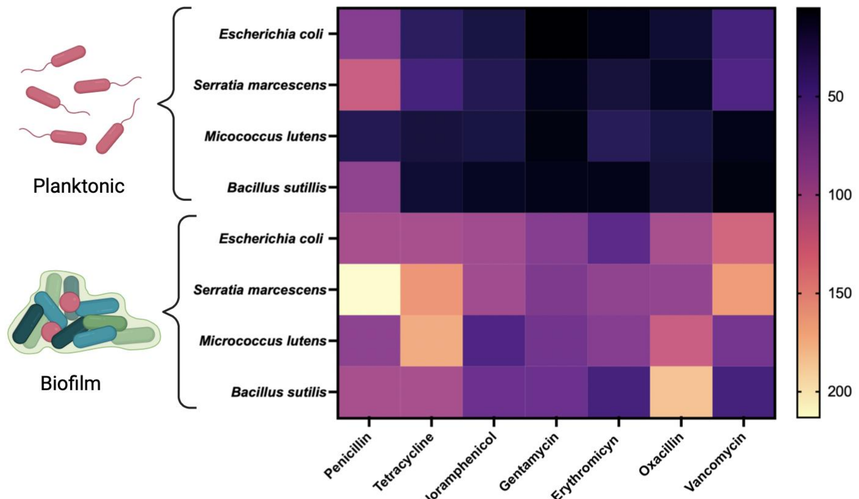


Figure 3. Heatmap indicating the susceptibility pattern of different bacterial strains (planktonic and biofilms) to multiple antibacterials, the darker the color in the map indicates a lower concentration needed to kill 90% of bacterial cells

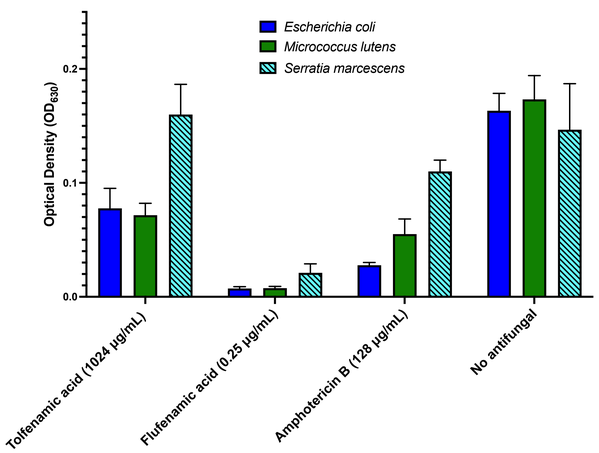
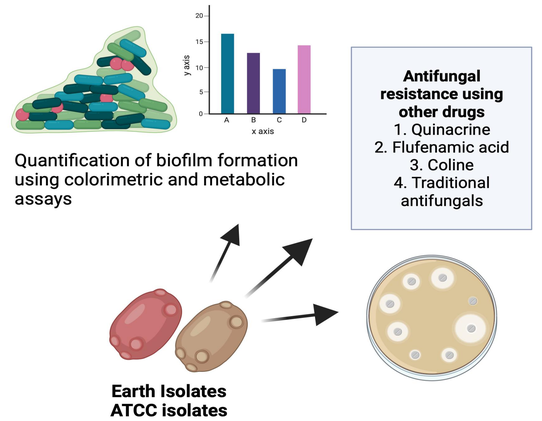


Figure 4. Drug repurposing assay performed in planktonic cells as an alternative to traditional antibacterials. Two NSAIDS and one antifungal were tested

Discussion and Future Perspectives

- Proved our hypothesis correct in comparing planktonic cells to biofilm cells
- The results confirm that biofilms are highly resistant to killing bactericidal antimicrobials, while planktonic cells are more susceptible
- This outcome indicates that biofilms are harder to treat
- For future perspectives, we plan to continue working with oral biofilms
- Our goal is to continue looking for alternative treatments, finding an efficient way to solve microbial affects on oral health and disease



Acknowledgements

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Space Fungi Team