Role of Protective Species in Inhibiting Virulence Factor in S. mutans

Lin, John (School: Boston Latin School)

Affecting over 2.4 billion people, dental caries is the most prevalent, global disease. Caries is caused by Streptococcus mutans, a bacteria that produces lactic acid, creating lesions in the enamel. Because of the cost and ineffectiveness of current treatments, there is a great need for more specific preventative methods against caries. The study aims to harness the oral microbiome to prevent caries by 1) elucidating the interactions between potentially “protective” bacteria and S. mutans and by 2) assessing the feasibility of ex vivo models for translational experimentation. It was hypothesized that protective species inhibit acid production in S. mutans thereby hindering caries development. Cocultures of S. mutans and protective bacteria were incubated in phenol-red plates, which serveas a pH indicator. Acid production on the plates was analyzed with a microelectrode and ImageJ. To determine biofilm feasibility on teeth, monocultures of both species were incubated in artificial saliva with third molars. SEM imaging was utilized to observe biofilm development on teeth. In the end, the study characterized a novel interaction between the protective species and S. mutans in that protective species significantly lower acid production in S. mutans. SEM imaging revealed that protective species formed biofilm in ex vivo models. These findings open the doors to various applications. The discovery that protective species form biofilms allows for translational studies to measure the impact of protective species on enamel dissolution. Clinically, the mechanism behind acid inhibition could be developed into a drug, leading to a more effective preventative measure against caries.