The Effects of Quorum Sensing Inhibitors on Multispecies Biofilms of the Oral Cavity

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Biofilms are defined as assemblages of one or more species of surface-associated bacterial cells and other microorganisms encapsulated by a self-produced extracellular matrix consisting primarily of polysaccharides, extracellular DNA, and proteins that adhere to firm surfaces. Biofilm formation is important in the microbial world and is considered an advantage over independent, planktonic counterparts due to its ability to resist antibiotics and evade the host's immune responses. Biofilms can form on a variety of environmental surfaces and can be considered both helpful and problematic depending upon the context of the biofilm. Pathogenetic biofilms within the oral cavity are particularly harmful because they provide little to no health benefits, but rather more commonly cause problems and disease such as dental caries, periodontal diseases, and persistent intra-radicular infections within treated root canals. Many of the damaging and disease-causing biofilms of the oral cavity often cause pain due to dental decay leading to dental caries and periodontal diseases. The WHO calls dental caries the most common and wide spread non-communicable disease in the world. Dental caries and other oral biofilm-related diseases can colonize any person with teeth across the entire world regardless of race, gender, age or socioeconomic status. In addition to causing oral diseases, if left untreated, studies suggests that oral biofilms can lead to more serious systemic diseases such as cardiovascular disease, bacterial pneumonia, diabetes mellitus, rheumatoid arthritis, and low birth weight. Quorum sensing (QS) is a communication system in biofilms that regulates gene expression in accordance to cell population density. QS in bacteria requires a minimum, critical concentration of bacterial cells in close proximity to one another in order to induce common, coordinated gene expression and coordinated responses to changes in their environment. QS gives bacteria the protection from antibiotics and immune responses that a biofilm provides. Quorum sensing inhibitory molecules, often referred to as quorum quenchers (QQ), have been studied due to their ability to disrupt the QS system in biofilms which potentially provides an alternative method of treatment for biofilm related diseases. With the era of antibiotic resistance at an all-time high, the need for alternative methods of treatment are crucial for researchers to investigate. The aim of this project is to investigate how multi-species oral biofilms respond to known QQ.