

Novel Signaling Molecule Utilized by *S. Mutans* for Biofilm Formation and Quorum Sensing

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BACKGROUND

Dental caries is one of the most widespread and costly diseases affecting western and developing countries. Caries arise from acid produced naturally during bacterial metabolism, primarily from oral pathogen *Streptococcus mutans*. When adherent to the tooth surface in an organized multi-bacterial architectural framework known as biofilm (commonly called dental plaque), *S. mutans* produce large amounts of acid, especially in the presence of sucrose, and eventually dissolve the protective enamel layer of the tooth creating the caries lesion. The growth of multi-species biofilms within the oral cavity is a complex and well-regulated process often involving sophisticated intra- and inter-species communication between many bacteria, including *S. mutans*. Though some signaling molecules involved have been identified, little is known about the requirements for *S. mutans* biofilm formation. Caries prevention by mechanical removal of plaque has remained the primary method favored by dentists for decades. No cleaning is completely effective, however, and bacterial biofilms containing *S. mutans* can reestablish on the tooth within hours. A significant need therefore exists for a therapeutic capable of preventing *S. mutans* biofilm colonization prior to caries formation.

INNOVATION

UCLA researchers have discovered an interspecies signaling molecule utilized by *S. mutans*. The molecule plays a role in biofilm development, and the deletion of the gene encoding this signal results in a super biofilm phenotype. The molecule is *S. mutans* selective, and is maximally produced by the bacteria during mid to late logarithmic growth phase in planktonic (non-biofilm) conditions.

APPLICATIONS

The *S. mutans* signaling molecule could be utilized as an agent to alter or prevent *S. mutans* biofilm formation and subsequent caries production. Dental plaque could be treated with the molecule to interrupt *S. mutans* signaling and reduce the number of bacteria committed to biofilm formation. Alternatively, the tooth surface could be coated after cleaning with the molecule to interrupt the cell signaling required for *S. mutans* colonization. Mutant *S. mutans* lacking the signal-producing gene could also be used as a background to discover other genes related to dental plaque formation.

RELATED MATERIALS

- ▶ [Mutation of luxS affects biofilm formation in Streptococcus mutans. Infect Immun. \(2003\)](#)

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	7,427,408	09/23/2008	2002-483

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OTHER INFORMATION

KEYWORDS

therapeutics, dental caries, dentistry, Streptococcus mutans, bacterial biofilm

CATEGORIZED AS

- ▶ **Medical**
 - ▶ Disease: Dental
 - ▶ Therapeutics

RELATED CASES

2002-483-0

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