

EFFECTS OF NICOTINE ON QUORUM SENSING IN *STREPTOCOCCUS MUTANS*

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*Streptococcus mutans* is gram-positive cocci, facultative anaerobic bacterium commonly found in the human oral cavity, and significantly contributes to caries. The quorum sensing system plays an important role in microbial cell-cell interactions that leads to development of dental plaque. *S. mutans* produces glucosyltransferases together with the glucan binding proteins in order to facilitate the adherence of glucans to the tooth surface, thereby forming biofilms. Moreover, previous studies indicate that in the presence or absence of sucrose, a cell surface protein called antigen I/II plays an important role in the adherence process of *S. mutans*. There is a relationship between smoking and dental caries, in which the smoking population has a higher incidence of dental caries than a non-smoking population. Nicotine is one of the most important components in tobacco. In this study we investigated the effects of nicotine on quorum sensing in *S. mutans*. An *S. mutans* wild type UA159 and its knockout mutants defective in *comC*, *comD* and *comE* were used to investigate planktonic cell growth, the biofilm formation and biofilm metabolism at different concentrations of nicotine (0-32 mg/ml). The effects of nicotine on quorum sensing for *S. mutans*' biofilm formation was evaluated using sucrose-dependent and sucrose-independent assays. The results indicate that *S. mutans* UA159 and its knockout mutants had no substantial differences in planktonic cell growth. In the presence of sucrose, the *comC* mutant was unable to produce biofilms, whereas the biofilm formation and biofilm metabolism of the *comD* and *comE* mutants were enhanced with increased nicotine concentration as with UA159 up to 8 mg/mL of nicotine. However, in the absence of sucrose, it was observed that the *ComC* mutant formed biofilms relatively similar to UA159. Biofilm formation in the *comD* and *comE* mutants was also enhanced with the increase of nicotine concentration up to 4 and 2 mg/mL, respectively. The results suggest that nicotine enhances the adherence process in *S. mutans* by antigen I/II through the comDE signaling pathway. However, the fact that the *comC* mutant produced biofilm in the absence of sucrose, but not in the presence of sucrose, indicates that the activity of antigen I/II is activated through different cell-cell signaling pathways depending on the amount of sucrose present.

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