

## Effects of Salts on Complex Bacterial Biofilm Formation

Hidenobu Senpuku, Ryoma Nakao

National Institute of Infectious Diseases

### Summary

Opportunistic pathogens are frequently isolated in oral plaque (oral biofilm) from bedridden elderly. In recent years, the cause of death of pneumonia became the third place past cerebrovascular disease. Oral microorganism is considered as one of pathogens for development of pneumonia. *Staphylococcus aureus*, which is also detected in the oral cavity as opportunistic bacteria, has been reported as a cause of infective endocarditis and cause of pneumonia. While salt is used for seasoning foods, salt is one of essential mineral components necessary for maintaining human body cells. However, from recent research results, salt has attracted attention as a substance promoting *S. aureus* biofilm formation. Therefore, this study was conducted to clarify how salt exerts its effect on biofilm formation by complex bacteria of *Streptococcus mutans* and *S. aureus* which are resident oral cavity bacteria. As a result, addition of some concentrations; 0.032 M, 0.064 M, and 0.125 M NaCl significantly increased biofilm formation by mixed bacteria of *S. mutans* and *S. aureus*. The viable cell count of *S. mutans* did not change much as compared with the single case, but the viable cell counts of *S. aureus* decreased at a fixed rate, in this mixed bacterial biofilm. The number of viable bacteria in the planktonic bacteria also decreased at a certain rate for both *S. mutans* and *S. aureus*. Therefore, the increase of biofilm formation might be induced by systems that viable bacteria died and their dead bacteria accumulated. Moreover, it was indicated that Com and Lux S-dependent quorum sensing system of *S. mutans* contributed to this biofilm formation. Taken together, it was considered that stress responses to some concentrations of NaCl activated quorum sensing and induced killed bacteria to form mixed bacterial biofilms of *S. mutans* and *S. aureus*. Considering that the salt concentration in saliva is around 0.25% and the blood is around 0.4%, the salt concentration (1% <) coming from the meal may affect the formation of mixed bacteria biofilm. Drinking or gargling with tea or water after a meal would reduce the amount of salinity in the oral cavity, therefore it seemed to be effective to prevent the increase of opportunistic pathogens.