Biofilm and surface microbiology バイオフィルム・界面

**PM-01**
Dispersal of *Pseudomonas aeruginosa* biofilms at oxygen levels change
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Acidic conditions change the surface of *Pseudomonas aeruginosa* biofilm by dissolving the outermost layer. The mechanism was mostly studied in the form of planktonic bacteria. However, in natural environments, a large number of bacteria are present in the form of biofilms, which consist of sessile bacteria embedded within a hydrated extracellular matrix. In recent studies, it is reported that the biofilms also have an ability to migrate and contract in the principal mechanism is different from chemotaxis.

**PM-02**
Analysis of the mechanism of *Pseudomonas aeruginosa* biofilm formation under anaerobic conditions
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Anaerobic conditions favor the formation of a unique biofilm structure due to the reduced oxygen environment. The formation of biofilms in anaerobic conditions is studied in *Pseudomonas aeruginosa*. However, most of the studies of biofilm formation have been performed under aerobic conditions. *P. aeruginosa* can use nitric oxides as alternative electron acceptors to produce energy when oxygen is depleted. Recently, it is reported that under aerobic conditions, cell shape and biofilm structure are different from anaerobic conditions. These changes led us to question how the biofilm development process differs from aerobic conditions. In this study, it was observed that the lifecycle of biofilm under anaerobic conditions is the same as aerobic conditions. However, EPS production was observed at the bottom layer of anaerobic biofilms which localization was not observed in aerobic biofilms. These results indicate that the role of EPS under anaerobic conditions may differ from aerobic conditions.

**PM-03**
Cbb3-type cytochrome c oxidase in aerobic respiration regulates anaerobic denitrifying growth and biofilm-like aggregate formation of *Pseudomonas aeruginosa*
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Aerobic respiration involves the cytochrome c oxidase. In a variety of bacteria, Cbb3 oxidase is known as a crucial enzyme in oxygen respiration, while it has been indicated that Cbb3 oxidase might also function under anaerobic environments. Therefore, we analyzed the role of Cbb3 oxidase in oxygen cycles of *P. aeruginosa* under anaerobic conditions.

**PM-04**
Growth, mutation frequency and biofilm formation of *Escherichia coli* cells exposed to imidazolium ionic liquids
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Imidazolium and imidazolium-like liquids have been studied as solvents for various industrial applications. Many ionic liquids have been synthesized and extensively studied for their applications. We analyzed the lifecycle, mutation frequency and biofilm formation of *Escherichia coli* cells exposed to low concentrations of imidazolium ionic liquids such as 1-ethyl-3-methylimidazolium tetrafluoroborate (EMImBF$_4$). Growth rate of *E. coli* cells incubated with 0.001% EMImBF$_4$ was almost the same as that of cells incubated without EMImBF$_4$. SEM analysis showed that the shape of *E. coli* cells exposed to 0.001% EMImBF$_4$ was almost the same as that of control cells. There was no significant difference in rate of mutagenesis resistance between EMImBF$_{4}$-exposed cells and control cells. These results indicated that *E. coli* cells grew normally in the presence of 0.001% EMImBF$_4$. Amounts of biofilms formed by *E. coli* cells in the presence or absence of 0.001% EMImBF$_4$ were analyzed by SEM. Experimental data showed that *E. coli* cells formed less biofilms when incubated with the agent compared to cells incubated without the agent. Our experimental results indicated that EMImBF$_4$ affected biofilm formation even at low concentrations harmless for bacterial growth and mutagenesis. Investigation of the effects of other ionic liquids on biofilm formation is in progress.