


Bacterial signaling to biofilms by bacterial signals and bacterial membrane vesicles

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Purpose and Background of the Research

● Outline of the Research

Bacterial membrane vesicles (MVs) have been found in a variety of environments, including the oceans and animal intestines, and it is becoming clear that the environment is full of MVs. It has also become clear that bacteria often form cell populations called biofilm in the environment and that bacterial signals are involved in BF formation. These findings led us to the idea that, in order to elucidate bacterial cell-cell communication in nature, it is necessary to clarify how cell populations in the BF state receive MVs and how signal transduction takes place. Previous studies on signal transduction by MVs have only been seen in free-living bacteria that do not form populations, and the findings in this assignment are expected to lead to a paradigm shift in the mechanism of bacterial communication in nature.

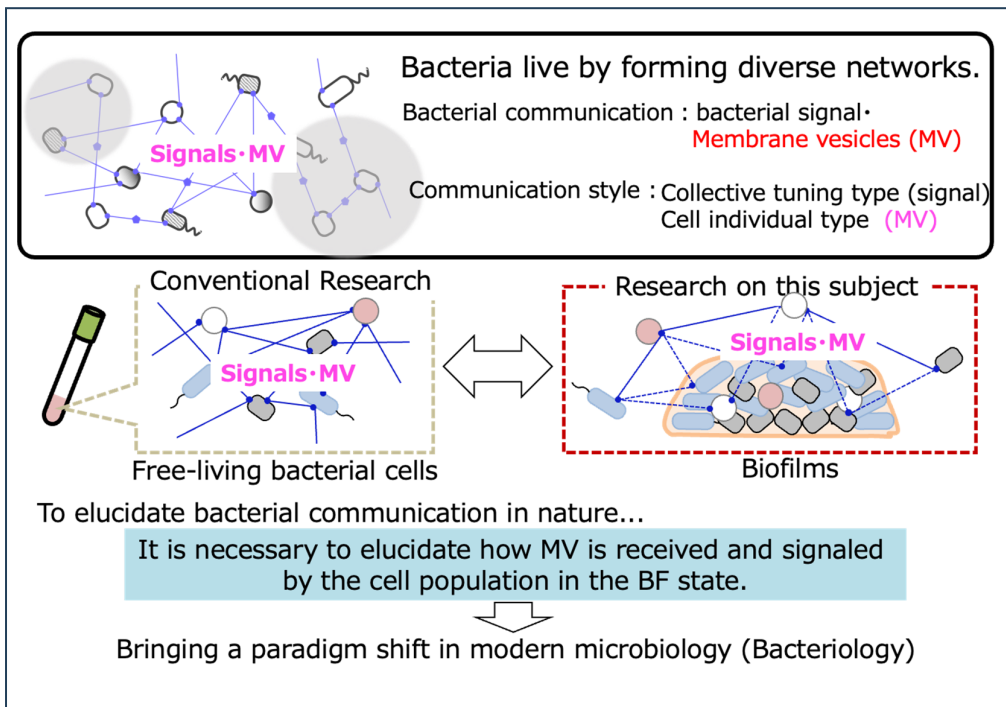
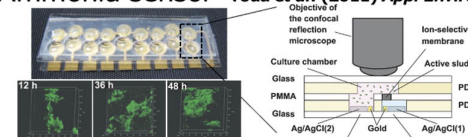


Figure 1. Conceptual diagram of this project

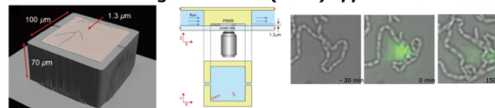
● Research Method
 Microfluidic device technology and proprietary imaging analysis technology are used to analyze BF.

Real-time biofilm observation using microfluidic devices

➤ Ammonia sensor *Toda et al. (2011) Appl Environ Microbiol*



➤ 2D chamber *Kunoh et al. (2020) ACS Nano*
Nagasawa et al. (2020) Appl Environ Microbiol



➤ Surfactant evaluation system *Nguyen et al. (2020) Langmuir*

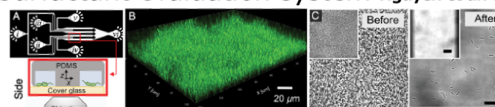


Figure 2. Microfluidic device for biofilm analysis and its imaging analysis

Expected Research Achievements

● This project aims to clarify the mechanism of signal transduction to BF by MVs containing signals alone or with signals.

The aim is to elucidate the mechanisms by which BFs receive MVs in order to understand bacterial communication in nature.

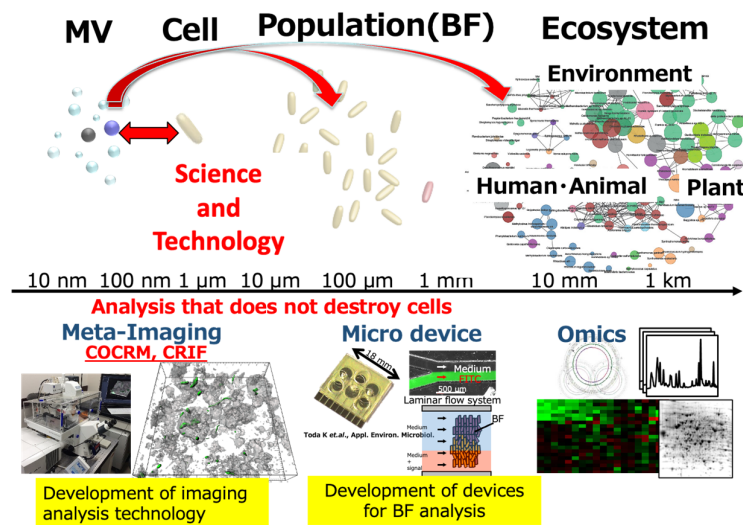


Figure 3. Approach to this project and its elucidation