A Broadly Applicable Transcription-Based Reporter for Gauging c-di-GMP Levels

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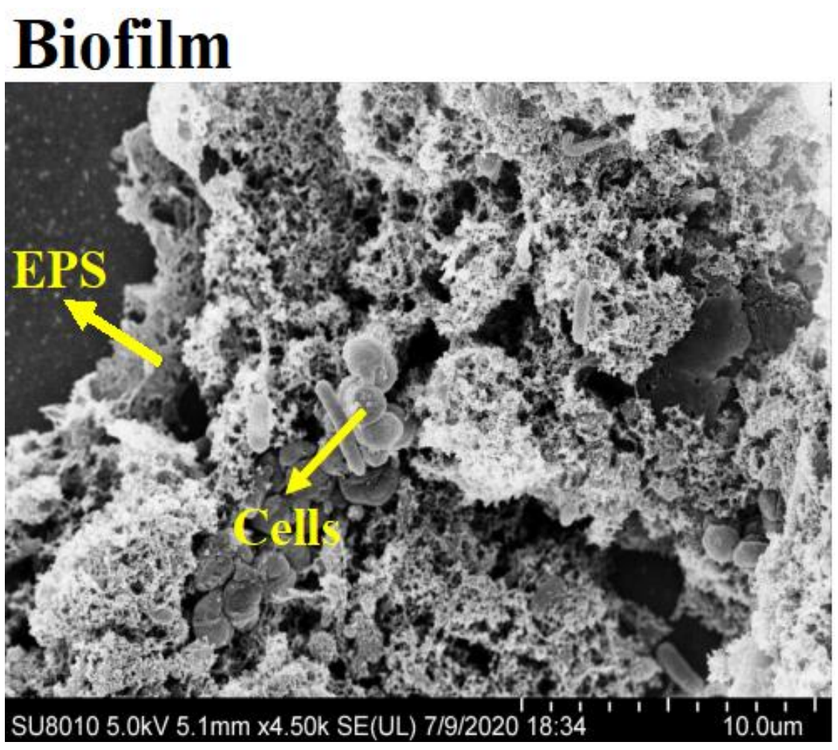
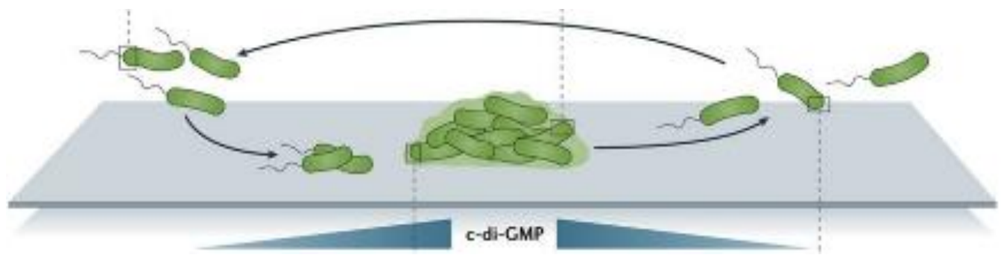
Introduction

Since biofilm presents the prevalent mode of microbial growth in natural, engineered and medical settings, the investigation of biofilm has become an attractive field of research. The second messenger c-di-GMP plays an essential role as a central regulator in biofilm formation. While numerous studies have examined the effects of c-di-GMP levels on biofilm formation, it has not been possible to monitor c-di-GMP levels in real time in many bacteria, which limits the development of research on biofilm biology and biofilm engineering. To overcome this limitation, we will construct a c-di-GMP biosensor that is readily adaptable for gauging c-di-GMP levels in different bacteria, and try to achieve cell-free system. This tool is sensitive, can supply real-time monitoring of c-di-GMP dynamics, and are amenable to high throughput screening.



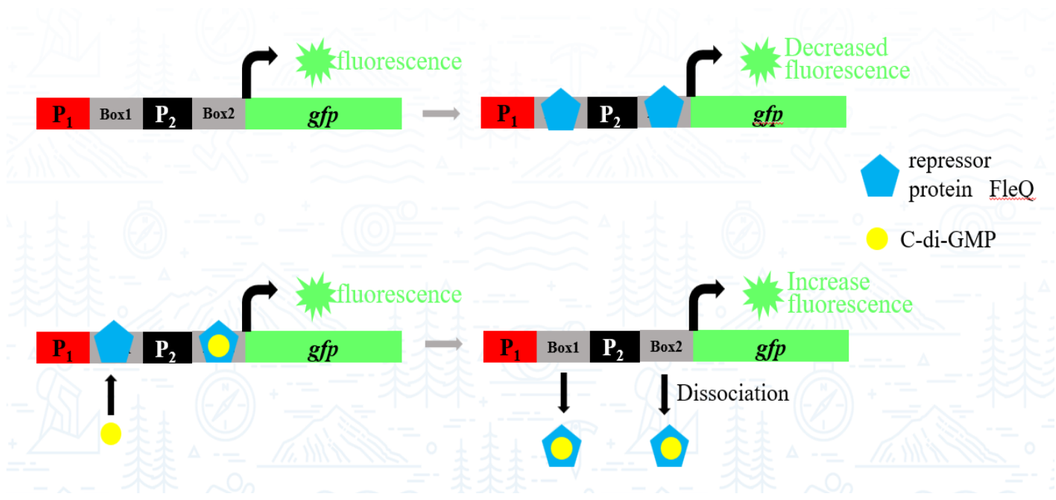
Yuhong Zhong, SEM photo of biofilm



Jenal et al. (2017) Nat. Rev. Microbial.

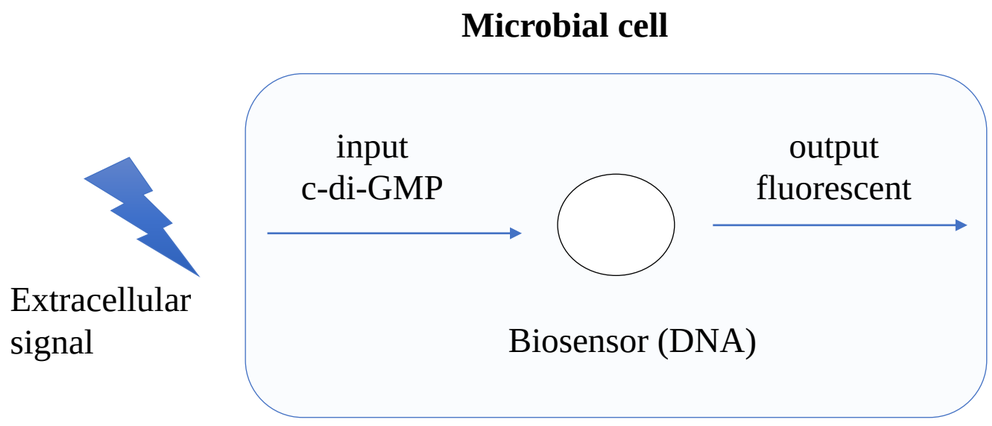
Design strategy

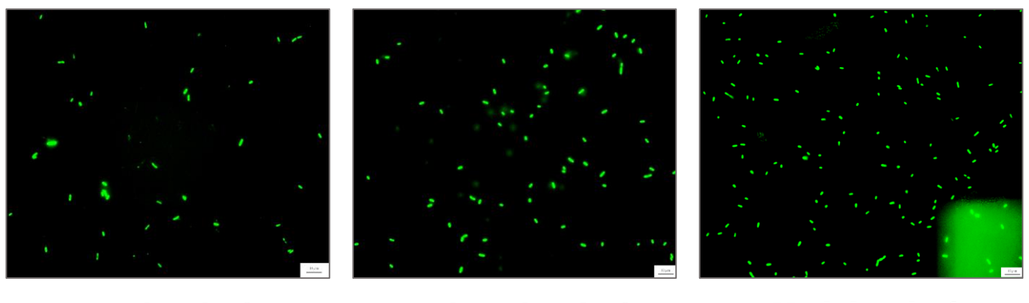
The main structures include tandem promoter (P_1, P_2), transcriptional regulatory factor (FleQ) and *gfp*.



Expected results

- Capable of high-throughput screening
- Sample preparation process is simple
- Real time detection



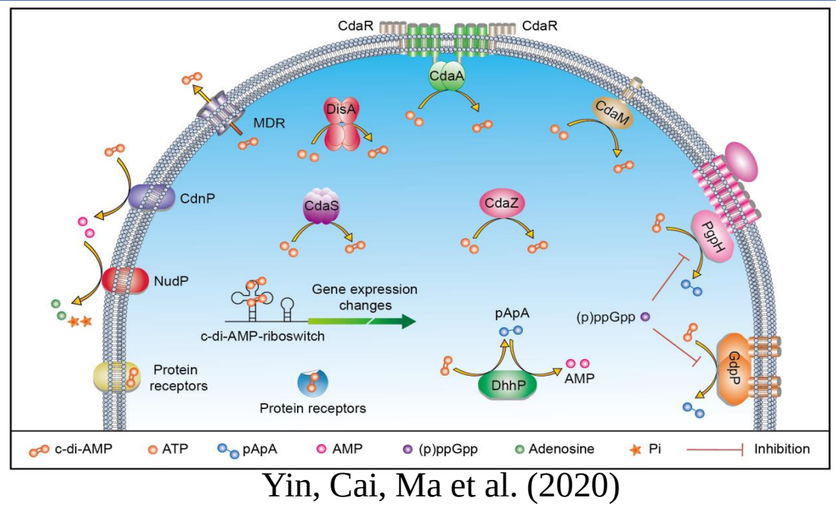

Low level of c-di-GMP

Medium level of c-di-GMP

High level of c-di-GMP

Application prospect

- Practical application: microbial contamination monitoring, engineering transformation of biofilm…
- Theoretical research: the formation mechanism of biofilm, signal molecule regulation…



Yin, Cai, Ma et al. (2020)