"Romeo and Juliet" by E.coli cell-cell communication

Abstract

In our project, we have recreated "Romeo and Juliet" vividly by Escherichia coli. To achieve the goal, we worked on two projects.

Project 1: We aimed to make E.coli play "Romeo and Juliet", and constructed Cell-cell communication system.

Project 2: We succeeded in producing Bioplastics, P(3HB), to make a rose which appears in the drama as a symbol of their love.

Wet experiments

Scene 1: Positive feedback system

I. Signal dependent signal production

By co-culturing Plux-LasI cell and Plas-LuxI cell, we confirmed the complete Positive feedback system where the production of a signal activates the production of the other signal. As a trigger of the Positive feedback system, we added the initial dose of C6 (5 nM) to each co-culture.

As compared red solid line with blue dotted line (both Plux-LasI cell and Plas-LuxI cell coexist), the result indicates that the C12 production in Plux-LasI cell was activated by initially added C6 (5 nM), whereas the C6 production in Plas-LuxI cell was not activated till C12 production in Plux-LasI cell reached sufficient level (1-2h). This behavior strongly suggests the appearance of the Positive feedback.

II. Time-dependent change assay

We designed the new Band detect system. Compared with the Weiss Lab’s Band detect system, our new part has 3 genes coding Lysis protein in Romeo cell and Juliet cell, respectively. We confirmed that it is important to harmonize them with α8, which is related to the suicide system in Juliet cell.

Feasibility of whole system

In the Juliet cell, the Juliet signal production results in the highest level under the particular range of Romeo signal concentration.

Parameter sensitivity and correlation analysis

We searched the feasible solution distribution of parameters that satisfies the specific time course to reproduce either "Romeo and Juliet" or "good ending story". Furthermore, we identified the most influential parameters dominating the dynamics of our Cell-cell communication.

Conclusion

We participated in a science cafe as assistants. We supported general public people who don't specialize in biology to discuss synthetic biology. The purpose of the science cafe is to provide a chance both for researchers and general citizens to reconsider the relationship between synthetic biology and human society. During the event, the general public people had planned many interesting and imaginary bacteria projects about the theme "bacteria that can realize dreams".

Attribution

We are proud to say that whole project we worked on this summer are sensitive parameters because their ranges are narrow in orange band.

Reference