iGEM Kyoto presents
two big summer projects
The two are extremely ambitious, and
there will be a good attributions
towards science.
The first one is...
Oscillation
RNA OSCILLATOR
WHY OSCILLATOR?

$T = 1 \text{sec.}$

$T = 20 \text{min.}$

$T = 24 \text{hours.}$
HOW OSCILLATE?

The amount of factor time
A activates B and A itself

B increases, and the repression of A becomes stronger

The activation of A becomes weaker, and the amount of B decreases

The amount of factor 1 decreases

The amount of factor 2 increases

The amount of factor 1 increases

The amount of factor 2 decreases
WHY RNA?

RNA Function Value

RNA Aptamers
Antisence (+)
Antisense (-)
tetR aptamer (+)
DFHBI
tetR and lacI is constitutively expressed
tetR and lacI is constitutively expressed
Parts Construction
Parts Assay
Oscillation Assay
So many parts!!!!
PROCESS

Parts Construction

tetR aptamer

BBa_K1126000
BBa_K1126001
BBa_K1126002

Attenuator
BBa_K1126004
BBa_K1126005
BBa_K1126006

Antisense
BBa_K1126007
BBa_K1126008
BBa_K1126009

3 x 3 x 3
Construction
Oscillation Assay
Parts Assay

PROCESS
24
We confirmed tetR aptamer is transcribed.

Parts Assay
PROCESS Oscillation Assay

We’ll show you this circuit functioning at MIT!!
Don’t miss it!!
ACHIEVEMENT

- Submitting Activator and Repressor RNA parts, and variants of each parts
- Confirming the transcription of tetR aptamer
Future Work

Confirming of transcription

Checking function of Repressor, Activator, and Reporter
If we completed the circuit,
there will be a big progress on Synthetic Biology.
The second project is...
Pattern Generation
Pattern Generator
Diffusion Speed
Diffusion Speed
Pattern Generation

The Amount of E-coli
Pattern Generation

The Amount of E-coli
Pattern Generation

The Amount of E-coli
Pattern Generation

The Amount of E-coli
Diffusible Substances

LasI

Quorum Sensing

RhII

LuxI
Diffusible Substances

Enterobactin

\[
\text{mass: } 725 \text{ g/mol (with iron)} \quad 213 \text{ g/mol}
\]
Pattern Generator
LuxI

luxI

luxR

lysis
LuxI

LuxI

Ent

entAr

entAr

LuxI

luxR

lysis
Pattern Generator
Enterobactin

entA deletion variant
Enterobactin

In Iron Poor Medium

wild type

entA deletion variant
Enterobactin

In Iron Poor Medium

wild type

entA deletion variant
Enterobactin

In Iron Poor Medium

wild type

entA deletion variant
Pattern Generator

entA\(^{+}\)  

\(\text{Ent} \rightarrow \text{Fe} \)  

\(\text{GFP} \rightarrow \text{luxR} \rightarrow \text{DT} \)  

\(\text{luxP} \rightarrow \text{lysis} \)  

\(\text{constitutive} \)

entA\(^{-}\)  

\(\text{LuxI} \rightarrow \)  

\(\text{RFP} \rightarrow \text{luxI} \rightarrow \text{DT} \)  

\(\text{constitutive} \)
Result
Other Systems
Future Works

- Super deletion variant

- New diffusion substance
Then let's move on to our final project
Human Practices
Q7 If you think the research on genetic engineering should continue, please encircle every fit reason from below.

- useful for food crisis.
- solve environmental problems.
- solve energy problems.
- applied to medicine.
- a business opportunity.
- preservation of the species.
- development of science.
- practical use in many countries.
- many possibilities.
- interesting as an academic.

Others ( )

College student (subtotal)  Others (subtotal)  Total
International Student Seminar at Kyoto
Questionnaire 2013
Cooperation
References


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