Luminesensor Programming Cells through Light

1 Luminesensor

Design
The function mechanism of our Luminesensor:
- DNA binding domain: N-terminal domain of the LexA protein, binds to DNA and inhibits DNA transcription, rigorously relying on dimerization.
- Photoreceptor domain: VVD protein, which can form a dimer after sensing blue light (440nm-480nm).
- VVD dimerizes
- VVD
- VVD

Photo sensor:
- VVD
- VVD

DNA binding

As expected, the reporter gene expression was repressed by our Luminesensor when exposed to blue light.

2 Light Communication

Preparation
Bacterial Luciferase (Cambridge 2010 iGEM) was chosen as the bio-luminescence source.

Response to Bio-luminescence
The reporter gene expression was repressed by bio-luminescence as effectively as by blue LED.

Device for light communication: the light emitting cell in a conical flask and fresh air pumped into the culture.

Switch-like to Dose-response
We managed to get closer to the linear range of our Luminesensor by diluting the light emitting cell broth.

Spectrum Expanding
According to the results of molecular docking a FAD analogue was chosen to red-shift the light absorbion spectrum.

3 Syn Bio in 2D & 3D

2D Bio-printing
A mask was used in 2D bio-printing and the resolution could be as high as 200µm.

The interface between cellular and electronic components was successfully constructed by employing iopad as the light source.

3D Printing
3D structure was built based on the various layers.