SPONGE PATROL: THE OCEAN'S WATCHER

OVERVIEW: OUR ENVIRONMENT? A DISASTER!
70% industrial waste ends up in the ocean.
14x10^11 tons of litter/year thrown into Earth's water (a sphere of diameter 1400 km).

DANGER for 2 M species, ~25% of all species, INCLUDING US!

AIM: Detecting chemical industrial wastes in endangered biotopes.

FOCUS: 5 of the most dangerous chemicals in water
- PCB, Phenol, Cadmium, Lead and Nitrate.

SOLUTION: A real-time in situ biosensor based on the combination of a Biofilter, a sponge, and a biosensor, a genetically modified sponge microbiome

ACHIEVEMENTS:
- Characterization of a new chassis (phenotype + genotype)
- Transformation of a new chassis
- Development of a new transposase system
- Improvement of phenol sensor
- Model of phenol sensors activities
- Model of the sponge ability to optimize sensing

POLICY & PRACTICES

- Reflection: Syntax wants to be the engineering of biology, but is inefficient and unpredictable. Rudges are inherent to the creative process, no matter how close to engineering it gets.
- Discussion: The ethical issues raised by the modification of an animal’s microbiome and its use as biomimetic tool.

EXTRA: Interlab study
We characterized the 3 requested constructions, and added 5 extras.
Corrected GFP fluorescence intensity according to OD 600 nm

MODELLED PREDICTIONS FOR SENSORS

PHENOL: (Kappa: Stochastic Rule-based modelling)
2 MODELS:
- Model 1: one phenol bind each DmpR dimere.
- Model 2: one phenol bind an hexamere.

RESULTS:
- Model 1: Production of GFP per time units
- Model 2: Production of GFP per time units

SPONGE PATROL
Let's marine sponges help us clean the oceans?

THE VIRTUAL SPONGE
Sponges can filter 1200 times their volume per day
BUT: Internal Quantity of compound VS External Concentration?

RESULTS:
Approximation of the compound accumulation effect caused by geometry

A NEW CHASSIS: Pseudovibrio denitrificans

A 5-step process to turn an unknown bacteria into an iGEM chassis:
1) GROWTH
2) SELECTIVITY
3) ELECTROPREPARATION-READY
4) A DNA ENGINEERING TOOL: TRANSPONS
5) GENOME ASSEMBLY

THE VIRTUAL SPONGE

MODELLED PREDICTIONS FOR SENSORS

PHENOL SENSORS:
- A constitutively-expressed DmpR will bind to P0 to promote GFP expression, only when DmpR binds to phenol.
- Best Signal Strength: BBA_1413002
- The strongest RBS => 2.5 times stronger signal for 1mM Phenol than the weakest one. 1µM Phenol signal is conserved in both Biobrick.
- Best Sensitivity: BBA_1413001
- The strongest RBS => lower induction ratio for 1µM and 1mM Phenol. Due to leakiness induced by the stronger RBS.

PCB SENSOR:
- To complement SACLAY 2013, we split their construct in 3 Biobricks, BBA_1413021, BBA_1413023 and BBA_1413024.

rnaseq:
- RNAseq data of Pseudovibrio fluorescence K82 are available to the iGEM community on demand to help teams find new sensors.

Two genetic circuits in the microbiote
- Two new genetic circuits for Phenol sensors.
- Construction:
  - Construction:
  - Construction:

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