Biofilms are responsible for billions of dollars in production losses and treatment costs in the industry every year:

- food spoilage or poisoning in the food industry
- pathogens' persistence and dispersal in health industry
- corrosion in the oil and water industry

Assuming that the environment is over-saturated with harmful chemicals such as biocides, whose long-term health effects still have to be elucidated, there is a great need for novel solutions to reduce detrimental biofilm effects.

**PROJECT STRATEGY**

**Objective**: Reduce the use of chemicals in cleaning processes.

**Solution**: Engineer bacterial "nanorobots" capable of infiltrating, destroying biofilms (KILL) and protecting the cleaned surfaces by either a surfactant coating (COAT option) or by establishment of a positive biofilm (STICK option).

**Experimental model**: Staphylococcus aureus as the detrimental biofilm.

**Advantages**: Bacillus strains are non-pathogenic, and do not cause equipment deterioration by corrosion. Supply of active substances within the biofilm should be facilitated by the tunnelling activity of bacillus swimmer cells. This biocide-alternative strategy provides a potential economy, and an environmentally-friendly solution for the control of unwanted biofilms.

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**MODELLING**

**GENE-REGULATORY NETWORK**

After the biofilm destruction: 2 alternatives
- Formation of a naturally toxic bio-surfactant and cells remain in planktonic form
- Establishment of a positive biofilm

**CONSTRUCTION**

*Construction of the biological model* - 2 promoters (Pm and Pp) - 1 repressor (Las and RhlP proteins) - 2 inducers (PTO [isopropyl β-D-1-thiogalactopyranoside] and PxyL), and two effector genes: gfp and abrB

*Las and RhlP*: repressors of Pm and Pp respectively

PTO and PxyL: inducers

In the absence of inducer both constructions are repressed.

PTO: RhlP expressed – No surfactant - No AbrB

PTO: RhlP inactivation - up andAbrB induction

PTO - Surfactant production and biofilm repression

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**INDUSTRIALIZATION**

**BIOFILM ISSUES: Clean surfaces + Protect surfaces**

**KILL**

**LYSOSTAPHIN**

- Part BBa_K802009

**DISPERISIN**

- Part BBa_K802001

**SURFACTIN + BIOFILM**

- Part BBa_K802009

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**HUMAN PRACTICE**

Which economic system for synthetic biology?

- 1/3: Private sector
- 1/3: Public sector
- 1/3: Commons

A commons as a solution:

- Introduction of BIOFILM KILLER
- 4h cycle in hydraulic system A: tank cleaning
- 4h cycle in hydraulic system B/C: circuit cleaning
- water recycling
- Introduction of 0.45 and 0.2 µm filters in

Why not define together the rules of a synthetic biology commons for iGEM?