Hydrophobofilm
Chemical coatings can be harmful

Heavy metals accumulate in ecosystems
Biofilm coatings are a good alternative

- Green
- Cheap
- Easy
Hydrophobic properties prevent fouling
Surface hydrophobicity in *Streptomyces coelicolor*
Chaplins are strongly hydrophobic proteins. Monomers assemble into extremely persistent amyloid fibers.
Chaplins: a group of hydrophobic proteins

Chp A–C
Hydrophobic

Large (±225 AA)
Hydrophilic
Cellwall anchor

Chp D–H
Hydrophobic

Small (±63 AA)

Chaplins: Biobricks

Chp E & H

Chp C

Chp *C

Sortase recognition site & Sortase from S. aureus
B. subtilis is a suitable host

- Forms relatively rigid biofilms
- Fast growing
- Gram positive
- Model organism
- Expertise

WT       Rok       degU
Chaplin expression via spaRK

Reliable expression system for *B. subtilis*

- **Subtilin**
  - **SpaK**
  - **SpaR**
  - **GFP**
  - **Chaplin**

**GFP expression by spaRK**

Fluorescence intensity (arbitrary units)

- **GFP1**
- **GFP2**

Subtilin percentage (v/v)
Chaplin detection

Thioflavin T: Amyloid specific staining

Purification of chaplins by total cell disruption and boiling in SDS.

ThT binds assembled chaplins, with fluorescent emissions between 460–600 nm, with an emission peak around 482 nm
Chaplin detection with ThT

Chp–E detected

Chp–C detected
Mass spectrometry confirmed successful expression of mature chaplins
Biofilm formation

1. Biomass accumulation
Biofilm formation

1. Biomass accumulation
2. Adhesion
Biofilm formation

1. Biomass accumulation
2. Adhesion
3. ECM formation
Biofilm coating

1. Biomass accumulation
2. Adhesion
3. ECM formation
Quorum sensing
ComX signaling
ComX signaling

comX expression model
Density dependent \textit{srfA} promotor activity
• *fst* encodes a toxic compound
• RNAIb binds RNAIa
• Difference in half life time
Hydrophobofilms

Biofilm formation
Chaplin expression
Kill switch
Applications
Integration of iGEM projects

iGEM team
Groningen 2010

Applying a biofilm on a surface by making a viscous medium paste
Integration of iGEM projects

iGEM team Groningen 2010

Applying a biofilm on a surface by making a viscous medium paste

Concrete repairing

B. subtilis

example:
iGEM team Newcastle 2010
Biofilm coating: versatile machine
Biofilm coating: versatile machine
Human practices

- Ethics & Safety

- Awareness:
  - Presentations at schools
  - Hands on lab experience
  - Debate (knowledge cafe)
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