INTRODUCTION

- Biofilms are communities of bacteria that live together on a surface, protected by an external layer.
- Bacteria inside the biofilm are far more resistant to antibiotics and industrial removal products.
- A better understanding of biofilms could accelerate drug testing and research.
- By engineering structured artificial biofilms testing could be improved, thereby saving time, money and lives.

HOW CAN WE MAKE RELIABLE AND REPRODUCIBLE BIOFILMS FOR TESTING?

HUMAN PRACTICES AND OUTREACH

Outreach
- Involving students: business case on biofilm innovation.
- Enriching interactions with society and academia.
- Appearances on radio and national news.
- We received K'NEX donations.

Experts opinion
- We received input and feedback from experts in the field!
  - 3D printing companies
  - Oral care
  - Biofilm research

Societal impact
- Biolink may improve drug safety and understanding of biofilms.
- We analyzed how our project could be marketed by creating a business plan.
- We designed a tool that helps evaluate goals of a project.
- Ethics and safety!

BIOLINKER

- Cells are printed within a hydrogel scaffold made of alginate and calcium chloride: our bioink!
- Induction with rhamnose enables the connection of neighboring cells by expressing curli proteins (CsgA) required for biofilm formation.
- The gel scaffold is dissolved with sodium chloride. The cells remain connected in the printed disposition due to the biofilm connections.

Cheap and safe
- Our printer is made of K’NEX pieces.
- Our printer is safe to use!
- Total price of Biolinker: 541 €
- Our printer is a DIY product!

Adaptable
- We are able to print different types of bacteria (collaboration Groningen).
- The printer is equipped with two gears.

Accurate
- Both gears print with consistent velocity.

RESULTS

Inducible CsgA production

Modeling the CsgA production:

Affinity tag

Biofilm 3D printing

After printing, the layered cells maintain their defined structure thanks to the bio-ink!

CONCLUSIONS

- We can control the CsgA production and therefore the biofilm strength.
- We incorporated affinity tags that show increased adhesion.
- We can print bacteria in layers.
- The Biolinker is a tool that contributes to the production of reliable and reproducible biofilms.

REFERENCES


