

# IGEM GRENoble 2020



The International Genetically Engineered Machine (iGEM) competition is a worldwide synthetic biology competition which takes place every year in Boston

## A few figures

- 80%** of chronic infections are linked to biofilms
- 65%** of bacterial infections involve biofilms
- 25 000** deaths per year in Europe due to antibiotic resistance
- 80%** of acquired resistance results from exchanges of genetic material between bacteria, favoured within biofilms

## What is a biofilm ?

- It is a multicellular community of microorganisms adhering to each other and to a surface, and marked by the secretion of an adhesive and protective matrix.
- It is an environment conducive to the development of pathogenic bacteria, initiator of deadly pathologies.
- It is a complex structure, making it difficult to target and eliminate.



## *Pseudomonas aeruginosa*

**BACTERIA** responsible for many nosocomial infections

**LEADING CAUSE** of mortality from cystic fibrosis

**25%** of these bacteria are resistant to broad-spectrum antibiotics.

**RESISTANT** in several pathologies such as cystic fibrosis or lung transplanted patients.

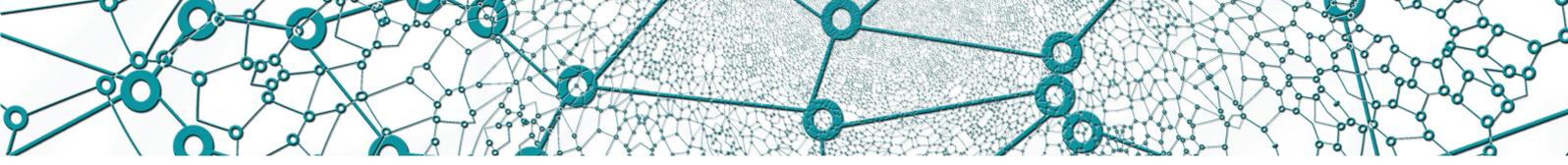
## Our objectives

**DECREASE** resistance to antibiotic therapies

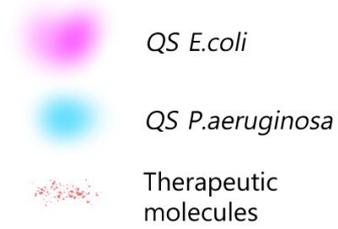
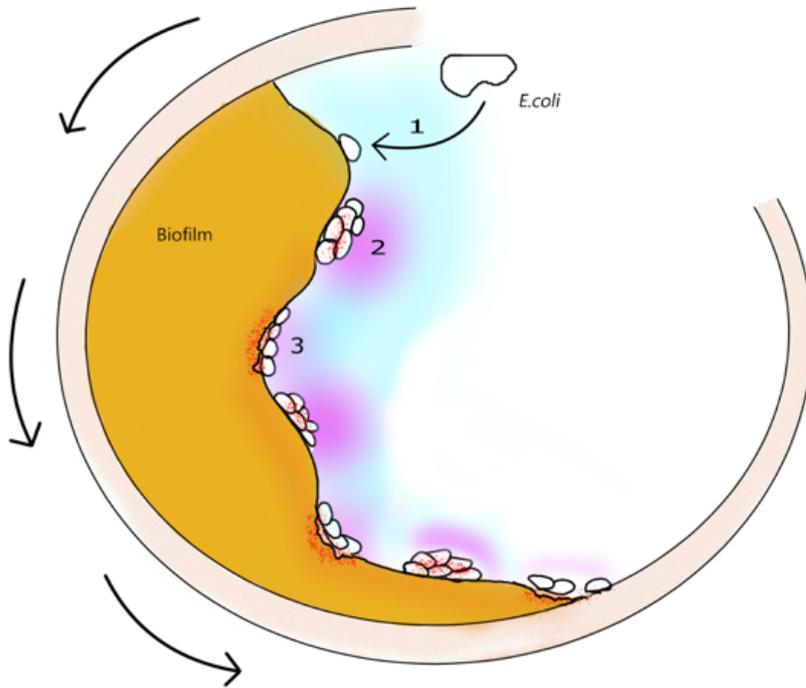
**IMPROVE** patients' quality of life

## Our project

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- Creating a new therapeutic pathway using *Escherichia coli*
  - Detection and destruction of *Pseudomonas aeruginosa* biofilm in the lungs of cystic fibrosis patients
  - Realization of the system by synthetic biology



## Biology side



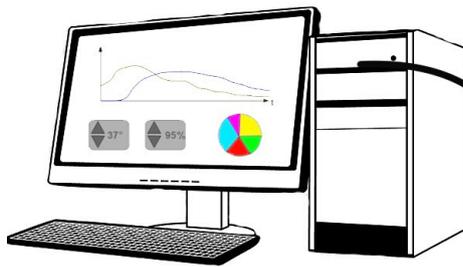
QS = Quorum sensing : Bacterial communication molecules

1. Detection of *P. aeruginosa* quorum-sensing by our modified *E. coli*
2. Development of *E. coli* and production of therapeutic molecules directed against the *P. aeruginosa* biofilm
3. Self-destruction of *E. coli* and release of their therapeutic molecules

→ This process is carried out until the biofilm is completely destroyed.



## Engineering side



- Monitoring the evolution of biofilm
- Measuring our therapeutic molecules efficacy
- Measuring changes in the *E. coli* population over time

- Realization of a test bench reproducing the pulmonary environment
  - Temperature
  - Hygrometry
  - Respiratory flow reproduction
  - Mucus-like matrix

