Introduction

The Water Problem
A growing worldwide population and increasing development makes water shortages increasingly severe.

Sustainable solutions are required to mitigate the effects of water stress.

Water is a global issue - by 2030, more than 50% of the world’s population are expected to suffer from water stress.

Our System Works!
We successfully processed our bulk produced cellulose into a filter like material which we functionalised with our CBD fusions.

Achievements

in iGEM
- Explored the language and international character of the competition
- Collaborated with artists to use our cellulose as a textile for fashion

Art & Design
- Including single cell analysis

Interlab Study
- Created a new functionalised cellulose UF membrane
- Created a library of cellulose-binding fusion proteins
- Achieved cellulose production in E.coli
- Sequenced two genomes
- Made a G. xylinus toolkit consisting of over 40 parts
- Created over 100 constructs
- Mass produced bacterial cellulose
- Collaborated with London BioHackspace & many others

Biosafety

Our manufactured membrane is free of living cells after pasteurisation and so is certified as non-GM for sale.

Cost Effective Manufacture

Increasing G. xylinus Productivity
We transformed our genetically engineered E. coli with plasmids containing the biosynthesis genes for Delta Acyl-Homoserine lactone (DAl) and the cholesterol biosynthesis genes (choAB) from B. subtilis.

Transferring Production Into E. coli
We used E. coli to produce cellulose by refactoring a high-producing cellulose operon (acsAB + acsCD) & transforming it on 2 separate plasmids (K123136 + K123135).

Material Properties

Scaling Production
In order to assess scalability of bacterial cellulose we bulk produced & harvested >70 pellets for further processing.

Processing Cellulose
In our treatment we found that cellulose held dye well & could be processed into many textures, shapes & forms.

Mechanical Testing
UF membranes operate under high pressure so we tensile tested our manufactured biomaterial to failure to validate our approach.

Cost Analysis

Cost of materials using our mass manufacturing protocol is significantly lower than existing alternatives and makes it commercially viable.

Achievements

- Created and patented a new plasmid library for cellulose production
- Developed an industrial plate and frame, dead end filtration setup where our membrane could be used
- Created a new functionalised cellulose UF membrane
- Created a library of cellulose-binding fusion proteins
- Achieved cellulose production in E.coli
- Sequenced two genomes
- Made a G. xylinus toolkit consisting of over 40 parts
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References: