Bio Detectors

Accurate and precise
Fast and visible response

Stable system
Versatile
Our Idea

Safie Smart stick

Detection on a digital screen

Azobenzene unique technology

There is no physical contact between the bacteria and food

Engineered E. coli

Dipping the stick in the food you'll find out if there are toxins in it
Fast Visible Output Accurate Detection

Bio-Detector

Our Idea

Accurate Detection

Fast Visible Output

Genetic Design

Bio-Detector

Size of Cluster

Photo Switch

1000

2000

3000

4000

5000
Accurate Detection

Fast Visible Output

Input

Bio-Detector

Output

Genetic Design
Dose Response

Genetic Design

Plac → RBS → LuxR → P

Normalized fluorescence (AV)

0.00001 0.1 100

AHL concentration (µM)

IPTH+  IPTG−
A Bi-Stable System
A Bi-Stable System

Signal

Analyte Concentration

Off

On

Dose response

Bistable
Improving work methods

- Design
- Experiments
- Modeling
- Assembly
Basic Design Modeling

Fokker-Planck solutions- Stochastic approach:

Starts ON

Starts OFF
RNA Splint – Noise Controller

**Diagram:**
- **Plux**
- **PartA**
- **PartB**
- **Ter**
- **mRNA part A**
- **mRNA part B**
- **T4 RNA Ligase**
- **RNA Splint**
- **Full mRNA**
- **IPTG**
RNA Splint Modeling

Fokker-Planck solutions Starts at **ON** state:

Fokker-Planck solutions Starts at **OFF** state:
Introduction

Synthetic Biofilm

High-throughput

Summary

Photo Switch
The Photo Switch

Communicative & reversible

Synthetic Biofilm
Under the Microscope

Without Azobenzene

With Azobenzene
Azobenzene – The magical molecule

The transition to the "sticky" form occurs with UV light.
High-throughput Experiments

Introduction
Synthetic Biofilm
High-throughput
Summary
**Bacterial Sediments**

Without Azobenzene

Sand falling creates a round shape out of symmetry
Bacterial Sediments

With Azobenzene

Without Azobenzene

With Azobenzene
So what did we do?

Achievements

- Set out to build a universal bio-detector for low-concentrations
- Designed a new protocol for building bi-stable biological systems (4 bi-stable systems)
- New high-throughput cloning (23 BioBricks)
- Created a synthetic bio-film

A smart self-assembling material
Merge of Fields, Merge of Cultures

Synthetic Biology in 3 languages

IS IT SAFE?
A GROUP OF ENGINEERING AND DESIGN STUDENTS ARE DEVELOPING A REVOLUTIONARY BIOLOGICAL SENSOR THAT DETECTS THE PRESENCE OF DIFFERENT SUBSTANCES.

GENETICALLY ENGINEERED E.Coli BACTERIA

IF THE ALLERGEN OR TOXIN ARE PRESENT IN THE SAMPLE, THE BACTERIA CHANGE COLOR AND TURN GREEN.

THE BACTERIA CAN DETECT ALLERGENS AND TOXINS IN A FOOD SAMPLE.
1st iGEM High School Israel Team
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Lior Levy
Inbal Vaknin
Michal Brunwasser
Noa Katz

And to Our Sponsors
Thanks for listening
Toggle Switch

Genetic Design

Design

Modeling

Experiments

Assembly

2

RBS

P

lac

CI

RBS

T7 polymerase

LacI

CI

LacI

PCI

Plac
Stable Design Modeling

Genetic Design

Experiments → 2 Modeling → Design → Assembly

Without Analyte

With Analyte
Achievements

- Designed a new protocol for building bistable biological systems
- Submitted 23 BioBricks
- New high-throughput cloning method
- Created synthetic biofilm
The Photo Switch

A smart self assembling material