A new strategy to detect antibiotics in milk

Based on sensors with controllable bio-enhanced blocks
A new strategy to detect antibiotics in milk

---Based on sensors with controllable bio-enhanced blocks
Four more people in Singapore have been infected by the new superbug, the drug-resistant New Delhi metallo-

lactamase-1 (NDM-1), bringing the total to six.

Of the latest cases, three were elderly patients aged between 74 and 84 but the fourth was in his 30s. As none of them had travelled abroad, it is likely that they had caught the bug locally.

The youngest patient may have acquired the superbug while in hospital as he developed a urinary tract infection after a two-month stay in the hospital.

A new article in The Straits Times last month highlighted the potential of NDM-1 to devastate public health internationally.

A travel writer, Maryn McKenna, has written a book about the superbug, titled "The Last Resort."
Outline

Sensors

Controller

Measurement

Summary

Background

Worry

Idea

Biological

Measurement

Controller

Measurement

Background

Worry

Idea
<table>
<thead>
<tr>
<th>kinds of antibiotics</th>
<th>importance of detection</th>
<th>degree of completion</th>
<th>new or old sensors</th>
<th>whether commit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetracycline</td>
<td>5 stars</td>
<td>completed</td>
<td>old</td>
<td>√</td>
</tr>
<tr>
<td>β—Lactam</td>
<td>5 stars</td>
<td>completed</td>
<td>new</td>
<td>√</td>
</tr>
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<td>Macrolide</td>
<td>3 stars</td>
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<td>new</td>
<td>×</td>
</tr>
<tr>
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<td>3 stars</td>
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<td>new</td>
<td>×</td>
</tr>
<tr>
<td>Kanamycin</td>
<td>1 star</td>
<td>preparing</td>
<td>new</td>
<td>×</td>
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</table>
tetracycline

β—Lactam

tetR

PltetO1

gfp

tet
tetracycline

β—Lactam

pSB 1K3
Activation of BlaR1 Protein of Methicillin-resistant Staphylococcus aureus, Its Proteolytic Processing, and Recovery from Induction of Resistance*
Activation of BlaR1 Protein of Methicillin-resistant Staphylococcus aureus, Its Proteolytic Processing, and Recovery from Induction of Resistance*
tetracycline

β—Lactam

 activated BlaR1

Zn2+
Proteolysis and gene depression

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tetracycline

β—Lactam

Proteolysis and gene depression
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tetracycline

β—Lactam

blaR1

blaZ

O/P

O/P

tetracycline

β—Lactam

egfp
tetracycline

β—Lactam

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BlaR1

BlaI

β—Lactam

blaR1

blaI

O/P

O/P

blaZ O/P

bla O/P
The fluorescence intensity of EGFP induced by tetracycline

**Outline**
- Sensors
- Controller
- Measurement
- Summary

**Diagram Description**
- Tetracycline
- β-Lactam

**Graph Details**
- X-axis: Concentration (ng/ml)
- Y-axis: Fluorescence Intensity
- Graph shows the fluorescence intensity over time for different concentrations:
  - 1h
  - 2h
  - 3h

**Textual Content**
- The fluorescence intensity of EGFP induced by tetracycline.
The fluorescence intensity of EGFP induced by Beta-Lactam.
No egfp

T7 promoter

T7 RNA polymerase

lacO

lacI
The fluorescence intensity of EGFP

- The fluorescence intensity is measured as concentration in ng/ml.
- The graph shows two lines:
  - Orange line: only egfp transduction
  - Blue line: amplifier plasmid transduction

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<th>Concentration (ng/ml)</th>
<th>Fluorescence Intensity</th>
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<tr>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>20</td>
<td>6.5</td>
</tr>
<tr>
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<td>7</td>
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<td>8.5</td>
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<tr>
<td>120</td>
<td>8.5</td>
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</table>

Note: The graph illustrates the relationship between concentration and fluorescence intensity for both transduction methods.
The fluorescence intensity of EGFP

- Controller plasmid transduction, IPTG=0
- Controller plasmid transduction, IPTG=0.33ug/L

The x-axis represents the concentration in ng/ml, and the y-axis represents the fluorescence intensity.
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<td>β—Lactam</td>
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<td>×</td>
</tr>
</tbody>
</table>
Our aim is to convert the biological achievements into practical productive forces.

-------BIT iGEM team
Sensor
(Theoretically possible, data valid)

Controller
(Theoretically possible, mathematical model support)

Device
(Theoretically possible, data valid)
Fluorescein sodium-Fluorescence intensity curve

\[ R^2 = 0.9842 \]

Relative fluorescence intensity

Fluorescein sodium concentration (ng/ml)

**Introduction**

**Data**

**Sample test**

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Fluorescein sodium - Fluorescence intensity curve

Relative fluorescence intensity

Fluorescein sodium concentration (ng/ml)

R² = 0.994
Sample 0. Safe (Blank)
Sample 1. Harmful
Sample 2. Safe
Sample 3. Safe
Sample 4. Safe
Sample 5. Toxic
Sample 6. Safe
Sample 7. Safe
HPLC method:

Our method:
Data analysis

Introduction

Data

Sample test

Pretreatment

Process(15min)

Column preparation(1h)

Data analysis

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Summary
Look at the screen
wait
Add

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Summary

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Sample test

Add
wait
Look at the screen

Relative Florescence =
40 Safe

Sample test

Measurement

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Add
Biological chip (Concept)
Document the characterization of our parts in the 'Main Page' of that Part's Registry entry and submit it to the iGEM Parts Registry.

Describe the implications that have been taken into consideration in the design and execution of our project.

Join and help other registered iGEM teams.

Outline and detail with a new approach to an issue of Human Practice in synthetic biology that is relates to our project.
Instructors

Prof. Yulin Deng

Prof. Hong Qing

Prof. Hong Ma
Advisors

Liu Kefu  Qin kuiwei  Man yan  Lei runhong
Outline

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Acknowledge

Human practice
What is the iGEM Competition?

The International Genetically Engineered Machine (iGEM) is a premier undergraduate Synthetic Biology competition. Student teams are given a list of biological parts at the beginning of the summer from the Registry of Standard Biological Parts. Working on their own schools over the summer, they assemble parts and new parts of their own design to build biological systems and operate them in living cells. This project-based and competition format is an exceptionally motivating and effective teaching method.

In 2011, iGEM expanded to include a High School Grand Prix and an Entrepreneurship Division in 2012.
Thanks for your attention