News Letter

NO.5

2015. 7. 15 Today's Topic

Project Update and Human Practices

Welcome to our newsletter.

· Amoy · Paris_Bettencourt · Pasteur_Paris ·

Dear All,
Here comes the fifth issue.

We are sincerely sorry for our typos in previous edition.
We would like to apologize to NAIT-Edmonton for missing an important paragraph.

This issue consists four parts:
Project Update;
Interview;
Human Practices
& About Competition System.

Thanks to the following twenty teams:

Aix -Marseille, Birkbeck, BGU_Israel, CGU_Taiwan,
ETH-Zürich, Exeter, NAIT_Edmonton, NYMU-Taipei,
Paris_Bettencourt, Pasteur_Paris, Purdue, Stockholm,
Tec-Monterrey, TecCEM, TecCEM_HS, Tianjin,
TU Eindhoven, Uniandes_Colombia, USTC and Zamorano.

Thanks to all of you for your contributions!

If there are any questions, please reach us at igemxmu@gmail.com

All the best! Cheer for the summer!

iGEM Amoy

2015-7-15

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PROJECT

By: Twenty iGEM Teams
Show you our projects

iGEM 2015 team Aix-Marseille

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https://www.facebook.com/iGEM.AMU?ref=aymt_homepage_panel
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Fight chewing-gum pollution, that's our aim!

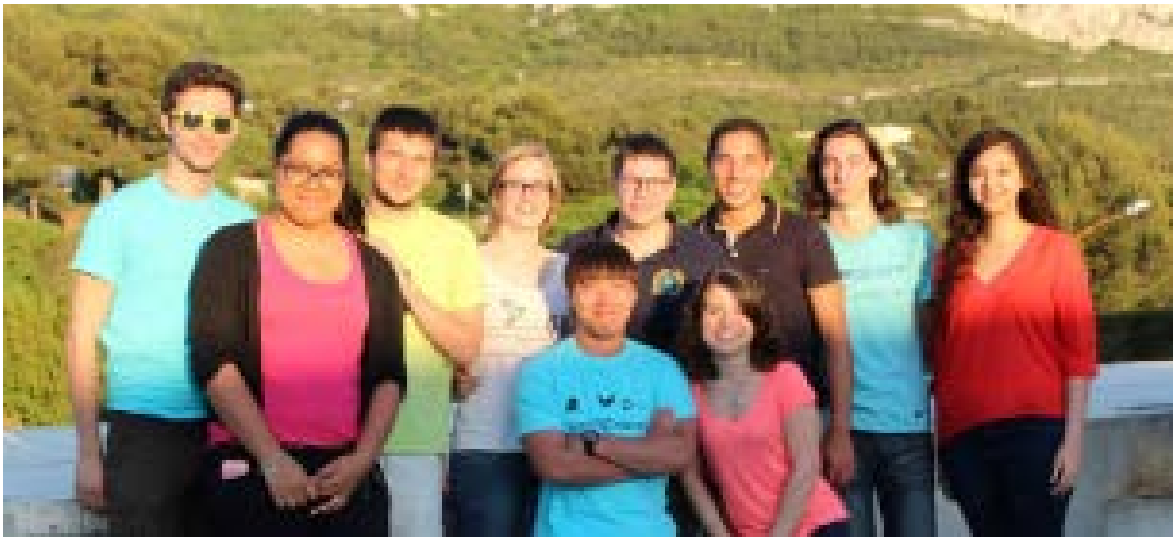
Our project is to create an E.coli strain which can degrade rubber polymers and a fortiori get-off chewing-gum from streets. For this purpose, we will use a combination of three enzymes, a laccase which is known as an oxidoreductase, a latex clearing protein (LCP), and finally a cytochrome c that we will fuse with the laccase. We think this latter could, after light exciting, be

[Logo - Aix -Marseille]

oxidized by the laccase that will generate a superoxide enables to degrade synthetics polymers found in the chewing gum. To optimize cytochrome production, several genes involved in cytochrome maturation and one in heme biosynthesis will be introduced.

In order to have the most promising results, we will try many combinations with the 4 laccase, 2 LCP and 2 cytochromes we have judiciously selected.

Moreover, in the light of creating fused proteins, we were stunned by the lack of information about linker designing. Therefore, we will try to create a tool to design easily linker to make protein fusion.



[Team - Aix -Marseille]

iGEM 2015 team

BGU_ Israel

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Engineering a Novel Synthetic System for Cancer Therapy & Diagnostics

International competition in the Synthetic Biology field - iGEM 2015

The rapidly evolving field of synthetic biology holds tremendous therapeutic potential. Synthetic biology aims to design and construct facilities or biological systems with useful purposes, by using tools from biology, biotechnology, biochemistry and engineering. This field of research has a great impact on various areas of life, including energy, medicine, environment and more. This September, we will represent Ben-Gurion University of the Negev at the iGEM competition in Boston, MA.

iGEM Competition

iGEM (International Genetically Engineered Machine) is a prestigious international competition for students, which leads and promotes innovative initiatives in the field of Synthetic Biology and Genetic Engineering. iGEM's main goal is to develop an open community and support collaboration, involving both students and the public in

Israel 2015 BGU BOOMERANG CANCER RESEARCH

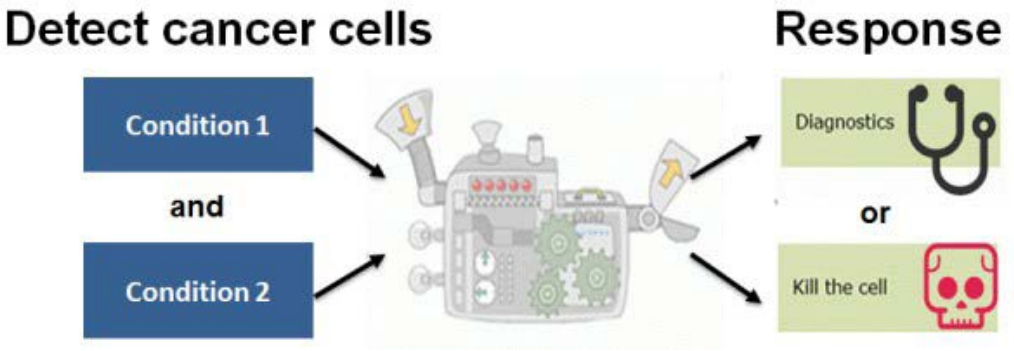
synthetic biology development.

iGEM BGU 2015 Project

This year, we have chosen to focus on developing applications for the diagnosis and treatment of cancer.

Despite the huge investment in research and the development of a variety of treatment methods, cancer is still a major cause of death in the world. Today, both surgical and pharmacological treatments against most types of cancer are not accurate enough to identify and treat the disease on a cellular level. On the other hand, novel biological treatments being developed were only found effective for a relatively small number of patients.

In cancer, many cellular and molecular take place, enabling the tumor to develop and spread in the body. We believe that it is possible to take advantage of the many typical biological mechanisms of cancer cells, by developing a synthetic biology-based system for identifying and treating cancer on a cellular level. Together as a team, we developed a modular system which identifies numerous genetic changes in cancer cells and responds by activating a synthetic machine that executes a cell suicide program or enables color-based "tagging" of the cells for tumor detection, ensuring complete surgical removal. The novelty of the system relies on its high specificity, achieved by conditional activation based on a number of genetic changes that take place specifically in cancer cells. Because such changes vary depending on the person or type of tumors, a modular system of such will enable personalized care for each patient.



About Us

Our team includes eight students of different academic backgrounds (Biotechnology Engineering, Biology, Medicine, Neuroscience and Cognition, Economics & Political Science).

The team is supervised by Prof. Smadar Cohen, Dr. Emil Ruvinov and Dr. Efrat Forti from the department of Biotechnology Engineering.

We are excited to represent Ben-Gurion University of the Negev and compete with leading universities around the world. Our ambition is to contribute to the advancement of the State of Israel, and Ben-Gurion University in particular, bringing them to the forefront of development and innovation in the field of synthetic biology.

[Team - BGU]

Modular Construction of Bacteriophage for Diagnostic Systems

First-ever Birkbeck, University of London entry for iGEM

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http://2015.igem.org/Team:Birkbeck

BBK iGEM 2015

iGEM 2015 team

Birkbeck

This is the first year Birkbeck, University of London are participating in iGEM. Established in 1823 by George Birkbeck, it has been the staple of evening higher learning in London, providing busy working people from non-traditional student backgrounds with an internationally recognised education. As the Birkbeck iGEM 2015 team, we are investigating bacteriophage lambda, a virus which specifically infects E. coli, for its potential to change specificity to different bacteria. Coupled with a signal-generating circuit, this could enable the genetically modified bacteriophage to act as a detection or diagnosis tool in bacterial infections.

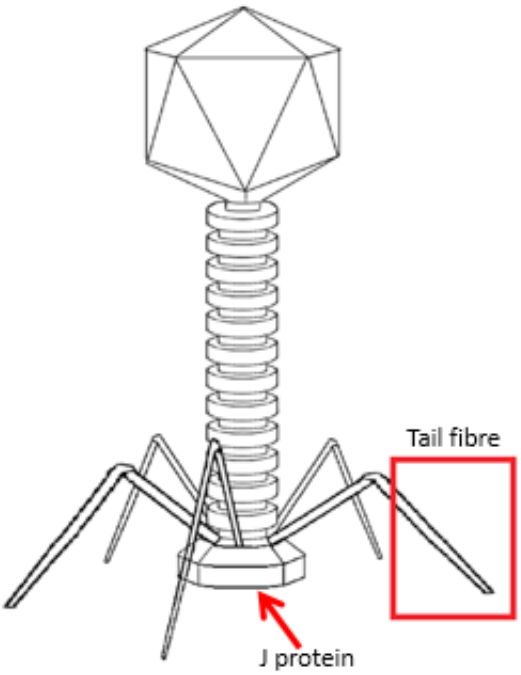
Currently, many diseases such as tuberculosis rely on long sample culturing times and sophisticated equipment in order to be diagnosed promptly and accurately for the patient, especially in deprived regions around the globe. These infections can be exacerbated by the very environment that prevents technologies available to wealthier areas to be accessed by ill people elsewhere, highlighting the need for rapid diagnosis for those particular bacterial diseases.

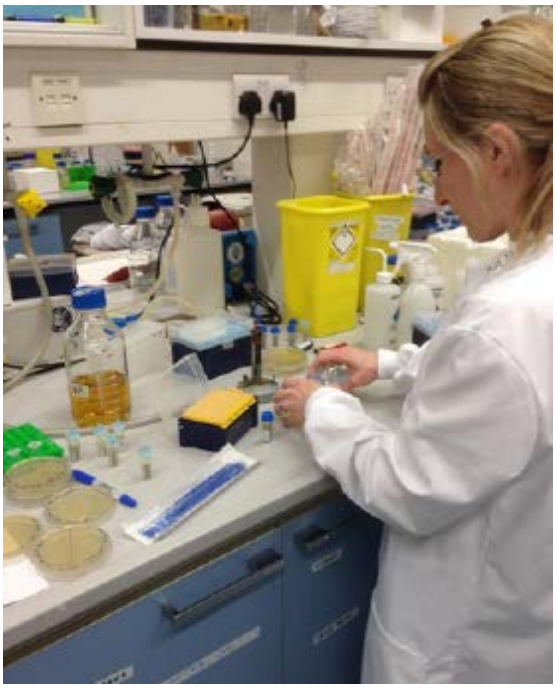
Bacteriophages are highly specific viruses which target bacteria. The mechanisms underlying their specificity in each case have yet to be understood fully, yet hold the key to many promising

applications including detection of a customized range of bacterial species or strains, whether in samples from patients or industrially in food. The signal introduced in the genetically engineered phage depends on application. Green fluorescent protein, chromoproteins and luciferase are a few examples of signals visible with the naked eye or under UV light.

We aim to turn specific bacteriophage lambda parts into BioBricks. The parts have been chosen based on their interaction with E. coli at the initial infection stage, where the phage attaches to bacteria and lyses its way in.

[Picture - Birkbeck]





Producing variations of these parts by directed evolution may enable the new phage to infect a different type of bacteria with a different receptor. In order to obtain more detail on how these phage parts specifically control the action of bacteriophage lambda, screening of viruses subjected to varying environmental stresses will also be undertaken. This approach allows natural selection to stimulate diversity and act as a screen.

Ultimately, if the bacteriophage can be characterised well enough, we would get to the point where we can establish it as a chassis with customizable modularity targeting different purposes. It could be made to specifically infect a given strain of bacteria and be used to prevent food poisoning; or its specificity could be geared towards tuberculosis in order to provide rapid diagnosis from patient samples. With the ever-increasing spectrum of virus-based application in biotechnology, we are confident our project is both promising and fascinating in its own right.

iGEM 2015 team

CGU_Taiwan

Facebook: Chang Gung University iGEMl
Twitter: iGEMCGU_Taiwan
Instagram: igemcgu_taiwan
Our Wiki: http://2015.igem.org/Team:CGU_Taiwan

Chang Gung University is the very first time participating in iGEM. We have seventeen pioneers from different departments(Biomedical Science, Chemical and Material Engineering, Electrical Engineering, Biotechnology and information Business), guided by Prof. Yang, Prof. Fugmann, Prof. Lo and Prof. Scott

[Team - CGU_Taiwan]

Our Project

Oral squamous cell carcinoma (OSCC) is a common cancer worldwide. One of the major problems of OSCC is that early malignancy could only be detected by clinical oral examination from health care professionals, and there are no clinical tests at the molecular level.

Recently, there are several RNAs and proteins reported as promising potential non-invasive biomarkers in saliva for OSCC. Our team plans to establish simple and quantifiable detection methods for those biomarkers. Our system includes two arms: 1) synthetic toehold switch gene regulators as RNA sensors to detect specific mRNA biomarkers and 2) engineered yeasts that express a reporter activated by IL-8, which is one of the most statistically significant protein biomarkers in OSCC saliva samples. These efforts will provide the groundwork for new molecular diagnoses in OSCC.

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MicroBeacon: the light at the end of the tunnel

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As you can see, we have changed our name to avoid legal issues that could potentially arise from the name CIA coli. Now, we are happy to introduce you to MicroBeacon! As a reminder, our project involves the detection of cancer cells using Escherichia coli in a multistep process. Apoptosis is selectively induced in cancer cells through an initial incubation of a sample of cells in a solution containing sTRAIL. Then, our transformed E. coli bind specifically to cancer cells in the sample. Once bound, the E. coli can detect the higher lactate production rate in cancer cells and produce a fluorescent signal.

iGEM 2015 team ETH-Zürich

So far, we have received most of our primers and G-blocks, and we can proudly say that our design is almost complete! Moreover, our advisors have kindly showed us how to manipulate mammalian cancer cells, so we are ready to induce apoptosis in them.
As part of our human practices, we recently visited two local schools to teach children about cells and DNA, and to engage them in a fun experiment of extracting DNA from a strawberry. The children thoroughly enjoyed the experience and showed a lot of interest, frequently asking questions to learn more about the topic. One girl even decided that she wanted to become a biologist later in life! Apart from this, we recently did an interview for a local newspaper, introducing them to our project, the iGEM project, and the field of synthetic biology in general. We hope that through this article we will reach a large reader base and introduce many to this exciting field of research!

iGEM 2015 team

Exeter

Introducing

RIBONOSTICS

A safe, low tech and cost effective manner to diagnose Bovine TB.

Why have we chosen this project?

In Devon Bovine TB is a truly challenging and devastating disease. Currently the test to diagnose TB in cattle can't differentiate between vaccinated and infected cattle. This means the BCG vaccine is banned. Without a useable vaccine and no effective measures to control how the disease spreads, Bovine TB causes misery for those it affects. Culling cattle is economically costly, emotionally challenging and takes no steps to actively combat M.bovis.

Hello!

We are the Exeter iGEM Team of 2015. Our project for the coming weeks involves detection of Mycobacterium bovis, the causative agent of Bovine TB. To do this we are planning on designing a Riboswitch. What is a Riboswitch? In simple terms it is a strand of RNA designed to be 'activated' when it binds to a specific complimentary RNA sequence. Binding causes a conformational change and expression of an indicator.

We want to build a safe, low tech and cost effective diagnosis system that can definitively detect the presence of M.bovis. In doing this we believe we are taking the first steps to ending this horrible disease.

Like us on Facebook, follow us on Twitter or feel free to drop us an email at: exeterigem@gmail.com.

We look forward to hearing from you.

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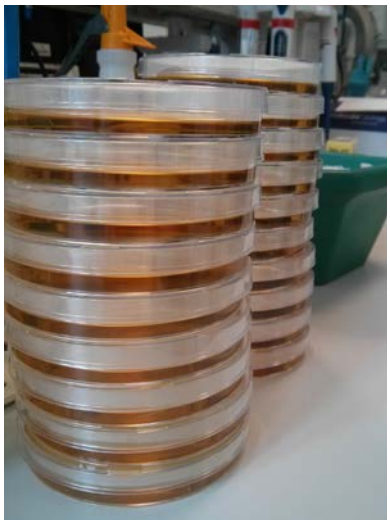
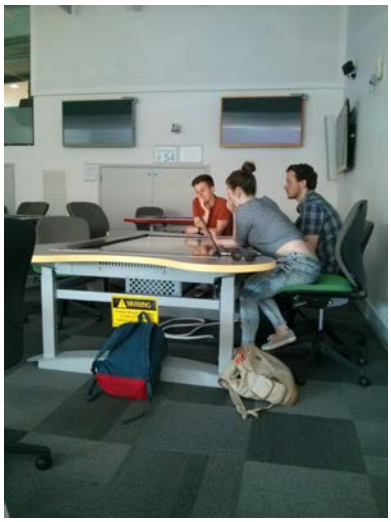
Team News!

Interlab Study



After signing up for the Interlab study we have spent time in the lab in order to get those glowing bacteria!

Modeling



Modeling team has been hard at work looking at Brownian motion of our system.

Wiki

Our wiki has begun to take shape after some great work by the wiki wizard David (and co).

iGEM 2015 team

NAIT_ Edmonton

The structural and functional study of the proteins expressed by a genome is called proteomics. This relatively novel science uses different methodologies in order to separate and identify specific proteins of interest. Among these techniques, SDS-PAGE plays an essential role due to its high sensitivity, low sample volume requirement, and high popularity. Negatively charged proteins migrate towards the positive electrode according to their size and charge. Smaller proteins migrate further in a given amount of time. As proteins are separated in this manner, users load molecular weight standards to estimate the size (in kDa) of the proteins present in their sample. Once the proteins of a single sample have been isolated and are embedded in the polyacrylamide (PA) gel matrix, staining procedures are used to visualize them.

Organic dyes, such as Coomassie blue, can be used for this purpose; nevertheless, their low sensitivity and a detection range that goes from 1 to 50 ng can be a challenge for detecting low abundance proteins (Jin, Huang, Yoo, & Choi, 2006). A higher sensitivity can be achieved by fluorescent staining techniques (from 0.1 to 10 ng.); however, UV instruments are necessary in order to read the data (Jin et al., 2006). The most sensitive method up to date is radiolabeling, but the requirement of hazardous isotopes and their complex management makes it a complicated procedure (Jin et al., 2006). Silver staining is a method that offers great sensitivity and an easy to handle protocol, thus making it one of the most commonly used staining methods.

Difficulties with silver staining arise when the molecular weight markers are re-colored golden-brown in the staining process. Markers offer evenly distributed proteins that show bands of equal intensity and known size. Researchers can compare these bands with their sample and identify the protein they are looking for based on its size. A subset of these markers has color-coded standard proteins to facilitate the identification of each band. Post-silver staining, the users lose the ability to use the color code as a reference.

Our goal is to develop a marker that,when interacting with the reagents used in the staining protocol, will develop colour bands in specific positions so as to help in the identification of the protein(s) of interest post-staining.In order to do so,investigation of how specific amino acids react with silver staining reagents is underway by our team. This will have as an outcome the creation of novel proteins that contain an excess of a particular amino acid and/or chemical modifications that will generate a specific

colour after treating it with silver staining reagents. To obtain such proteins, the introduction of novel nucleotide sequences into a plasmid would be done first by in vitro transcription translation and later by transforming E. coli cells with expression vectors.

Reference

Jin, L. T., Hwang, S. Y., Yoo, G. S., & Choi, J. K. (2006). A mass spectrometry compatible silver staining method for protein incorporating a new silver sensitizer in sodium dodecyl sulfate-polyacrylamide electrophoresis gels. Proteomics, 6(8), 2334-2337.

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iGEM 2015 team

NYMU-Taipei

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Wiki: http://igem.ym.edu.tw/

The story of NYMU-Taipei

The establishment of the NYMU-Taipei iGEM team can be traced back to 2007. Our instructor is a researcher in systems and synthetic biology, and was conducting studies in the field of genomics with his doctorate student at that time. He was confronted with two major problems then: First off, how do we verify the results of genome analysis? Secondly, what is the constitutional principle of genome? While doing literature research, our instructor came across the iGEM web page and immediately felt fascinated as iGEM encouraged students to race their imagination and in the process, inspired them to think out of the box and come up with novel ideas to tackle at different problems. Besides, the competition provided students with opportunities to exchange ideas with one another and gain learning experiences, which our instructor thought would be of great impact to our students. Therefore, he started recruiting iGEM participants in our school, National Yang Ming University, and attracted over fifty students in the first conference. However, as beginners, they inevitably faced a plethora of obstacles, yet they were fearless to make breakthroughs. Eventually, they won the gold medal in the first year under the title Taipei 2007 iGEM team.
It was the first chapter of our story, and the journey will undoubtedly go on.

2015 NYMU-Taipei

This year, the NYMU-Taipei team is mentored by professor Chuan-Hsiung Chang, Dr. Ching-Fen Chang and Mr. Jude Clapper. We've been brainstorming and contributing crazy ideas about iGEM. With their guidance, we now rejoice in the study process. Why did we participate in iGEM initially? We did a survey on our team members and received some answers as below:

HO-TSANG TSAI
It's fun!!!!!

PIN-HSUAN CHEN
For the sense of accomplishment in overcoming the frustration combing through web pages and HEAPS of paper and eventually completing the project... Somehow you knew that it'll be worth it as it is the goal you've always been striving to reach :)))

CLAIRE PENG
When I heard that iGEM was focused on all types of synthetic biology, I immediately became curious. I haven't had much experience in synthetic biology labs, so I wanted to join the iGEM team to expand my knowledge. I also saw it as a great way to meet new people and to actually pursue a project that was created by mainly students. Through iGEM, I hope to learn more techniques in the lab and to have our project be part of an international community.

HUIRU HUANG
I am interested in synthetic biology related research.

ALVIN WANG
Synthetic biology is interesting because it is not only about understanding the functions of organisms, but also using the knowledge to design and build useful devices. iGEM is even more interesting by involving synthetic biology with teamwork, international competition, human practice, and fun.

PO-WEN WANG
I'm a first grader now, and I should know more and want to know more about what I can do in future. And I also want to meet more people and grow with them.

WEI-HO CHEN
I want to explore the world and I also want to do something different as well as interesting.

JIUN-SHIAN TZENG
I want to learn about synthetic biology.
This is why our team members participate in iGEM and became a team. We really have fun!

真知力行 國立陽明大學 NATIONAL YANG-MING UNIVERSITY 仁心仁術

Our project this year

This year we are creating a new systematic way to fight against the notorious potato late blight caused by Phytophthora infestans. Potato serves as the third most important food crop in the world and the cultivation of which is also an important agricultural income in many countries. However, potatoes easily fall victim to P. infestans when temperature and moisture is suitable. What is even worse, if a single potato is infected by this kind of pathogen, there is a chance that the disease may spread to other potatoes in the farm via water and soil.

The biological control of the disease has attracted much attention recently. Scientists from different countries has synthesized or discovered various bioagent inducing resistance and bacteria causing antagonistic inhibition. However, there's no efficient way to prevent and fight against potato late blight. Also, the fungicide used nowadays is detrimental to both the pathogen and host. This year, the 2015 NYMU iGEM team has characterized a new defensin that can significantly weaken the zoospores as well as mycelia. In this way, P. infestans cannot absorb nutrient from potato tubers so that it can't survive through the winter, thus stopping the oomycete from thriving in the next spring.

Moreover, we designed a brand new mechanism that can be spontaneously triggered by salicylic acid and hydrogen peroxide. These chemicals are released when the potatoes are prone to pathogens. Inspired by competitive inhibition widely used in pharmacology, we designed and improved a competitive inhibitor aiding the entrance of P. infestans toxin (Avr 1) which can also bind to the receptor but with higher affinity.

Another major problem in the biological control of potato late blight is that there's no efficient way to detect whether the potato is susceptible to late blight. Therefore we create a soil-based microbial fuel cell (MFC) that can detect salicylic acid emission and produce oscillating current. Using this device, we can easily see the difference between the current produced by the MFC before and after infection.

In our design, we try to cover every aspect that can prevent, fight against, and detect potato late blight. We try to create a systematic way to prevent P. infestans to reduce and eventually eliminate the use of fungicide that might jeopardize the environment and other species. Furthermore, we will provide a standard procedure that can easily be followed by anyone without advanced knowledge on biology. We seek to not only secure the supply of food sources, but also to help farmers ride through the predicament. If successful, the by anyone without advanced knowledge on biology. We seek to not only secure the supply of food sources, but also to help farmers ride through the predicament. If successful, the project will illustrate the value of this technique as a way to make production more sustainable and address food security needs. The same general approach is applicable to other crops and can address other destructive diseases. It would benefit consumers, farmers, and the environment alike. However, the hard part is actually getting public acceptance for it. Thus, it is also important to raise global awareness and educate our communities on related issues as well as help our societies form a profound and non-biased opinion about synthetic biology and genetic engineering.

earch and improved education on biological science are incentives for school to join iGEM competition.

iGEM 2015 team Paris_ Bettencourt

Summary of the project:

Our team wants to tackle malnutrition in India. To do that, we are using the old tradition of rice fermentation, which has the virtue of changing the taste and adding some nutrients. Our goal is to genetically engineer microorganisms to make them produce vitamins while they are fermenting rice.

[Idli, a tasty small pancake made of fermented rice.]

What's up in the lab?

Our team is now fully working! We conceptually designed our work. We will make yeast expressing vitamin A by integrating into the chromosome a polycistronic insert for yeast. Vitamin B2 will be expressed by lactic acid bacteria, also by integrating into the chromosome 4 genes coming from Bacillus subtilis. To assess our work, we are developing riboswitchbased sensors to measure the concentration of vitamins.
In practice, we have ordered and finally received strains and plasmids. We are currently designing and ordering gBlocks and oligos, which are arriving one after the other.

What's up out of the lab?

We made some friends! iGEM Pasteur organized a meetup with all the iGEM teams from the Paris area. It was the opportunity for us to present our projects, share our thoughts and get to know each other!

Our team is highly involved in citizen science and we are preparing workshops to make people participate to our science and to get feedback on it. The next one will include talks, free discussions and tutorials about synthetic biology, fermentation, indian food and nutrition in general.

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Every year, more and more plastics are produced. In 2000, 190 million tons of plastic were produced in the world, whereas today, approximatively 300 million tons of plastic are produced.

However, today, the treatment of plastic waste is not adapted to this lightning production... In 2012, 25.2 million tonsof plastic waste were produced in Europe, among which only 26 % were recycled, while 36 % were burned in order to produce energy and the remaining 38 % were dumped or buried. At the end, this plastic is accumulated in the nature.
PlastiCure is a biological system based on E. coli designed to degrade plastics and use the degradation products to produce Biologically active compounds. The challenge of the project is to make this TWO pathways work simultaneously in ONE system.

By engineering the metabolism of E. coli we want to create a system able to produce a curative product and in the same time help address the issue of plastic pollution.

We participate too to the InterLab measurement study. We have all the biobricks we need and now we'll assemble all them!
It's the first year of iGEM Pasteur and for our first year in iGEM, we don't have any problems. The Pasteur institute helps us.

iGEM 2015 team Pasteur_ Paris

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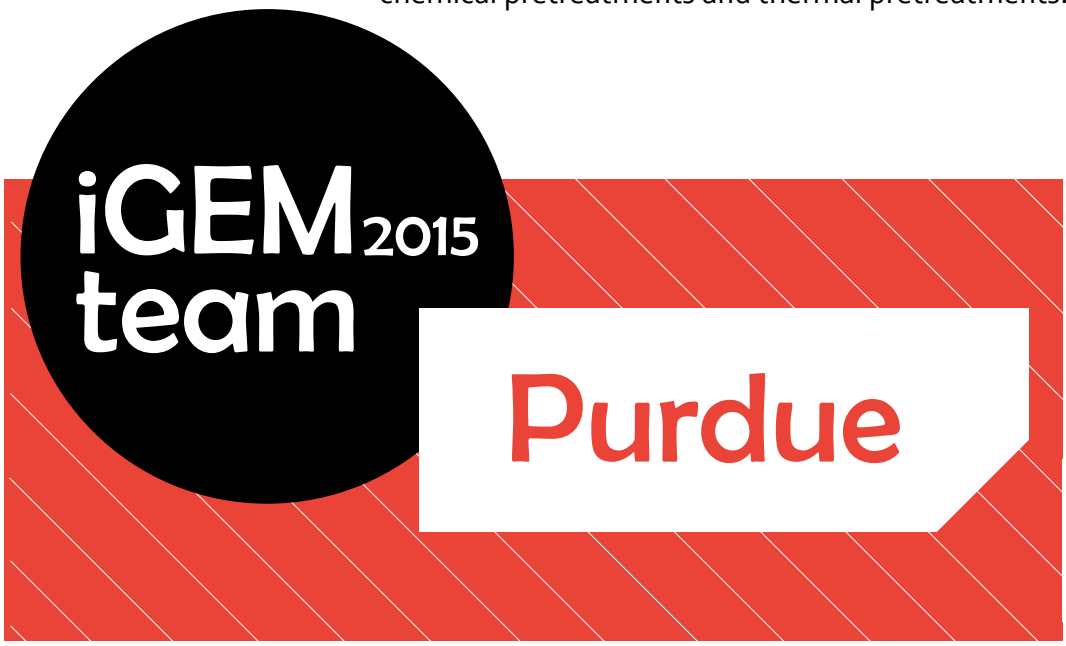
Purdue Biomakers' iGEM 2015 Project

Background

One of the main obstacles to overcome for ethanol producing bioreactors is a substance called lignin. Lignin is a very strong complex of aromatic compounds that make up a small part of the cell wall and utilizes a bond called Beta-O-4 to bind cellulose and hemicellulose together. Lignin has the important roles of maintaining the structural integrity of plants, acting as a defense mechanism from attacks by insects and fungi, and (*Image provided by: http://nsf.gov/news/mmg/media/images/lignin_h.jpg*)

transporting water between vascular tissues. Because of these multiple factors, lignin is an extremely hard substance to breakdown and significantly decreases the efficiency of bioreactors.

Current methods industries use to circumvent this problem are chemical pretreatments and thermal pretreatments. Chemical



pretreatments use chemicals to breakdown lignin; however, it produces extremely volatile byproducts that can pollute the environment if it is not correctly disposed, and can be costly to manage if it is correctly disposed. On the other hand, thermal pretreatments are just as expensive. Thermal pretreatments utilize extremely high temperatures to breakdown the Beta-O-4 bonds, which is difficult and costly to manage and maintain.

The Project

The goal of this year's Purdue Biomakers team is to increase the efficiency of existing biological pretreatments through the use of synthetic biology. The team plans to model, assay, and record the efficiencies of multiple lignin-degrading enzymes that they have implemented into baker's yeast (S. cerevisiae).

The Biomakers team use Baker's yeast because it is a well documented eukaryotic chassis and is known to be able to express both plant and animal genes. S. cerevisiae is also the primary microbe, and most efficient microbe, in sugar fermentation.

One problem the team encountered in their early research is that the monomers that resulted in lignin degradation inhibit the enzyme 1,4 beta-glucosidase, which plays a key role in polysaccharide fermentation. The primary method industries use to circumvent this problem is to add more glucosidase; however, this requires the industries to purchase more enzyme, thus decreasing cost efficiency. To fix this, the Biomakers team plans on combining their lignin degrading yeast strains with a newly designed yeast strain called J4-a.

J4-a is the first modified yeast strain that internalizes and combines multiple cellular/biological pathways utilized in polysaccharide fermentation and ethanol production. By combining the multiple processes and pathways, J4-a increases the efficiency of ethanol production by 200% and also increases the cost efficiency of the process. (J4-a was developed by a collaboration of the Department of Civil and Environmental Engineering, University of Pittsburgh, Department of Food Science and Human Nutrition and Institute for Genomic Biology, University of Illinois at Urbana-Champaign, Departments of Molecular and Cell Biology and Chemistry, University of California at (*Image of J4-a Yeast. Provided by: http://pubs.acs.org/doi/abs/10.1021/sb5003644*)

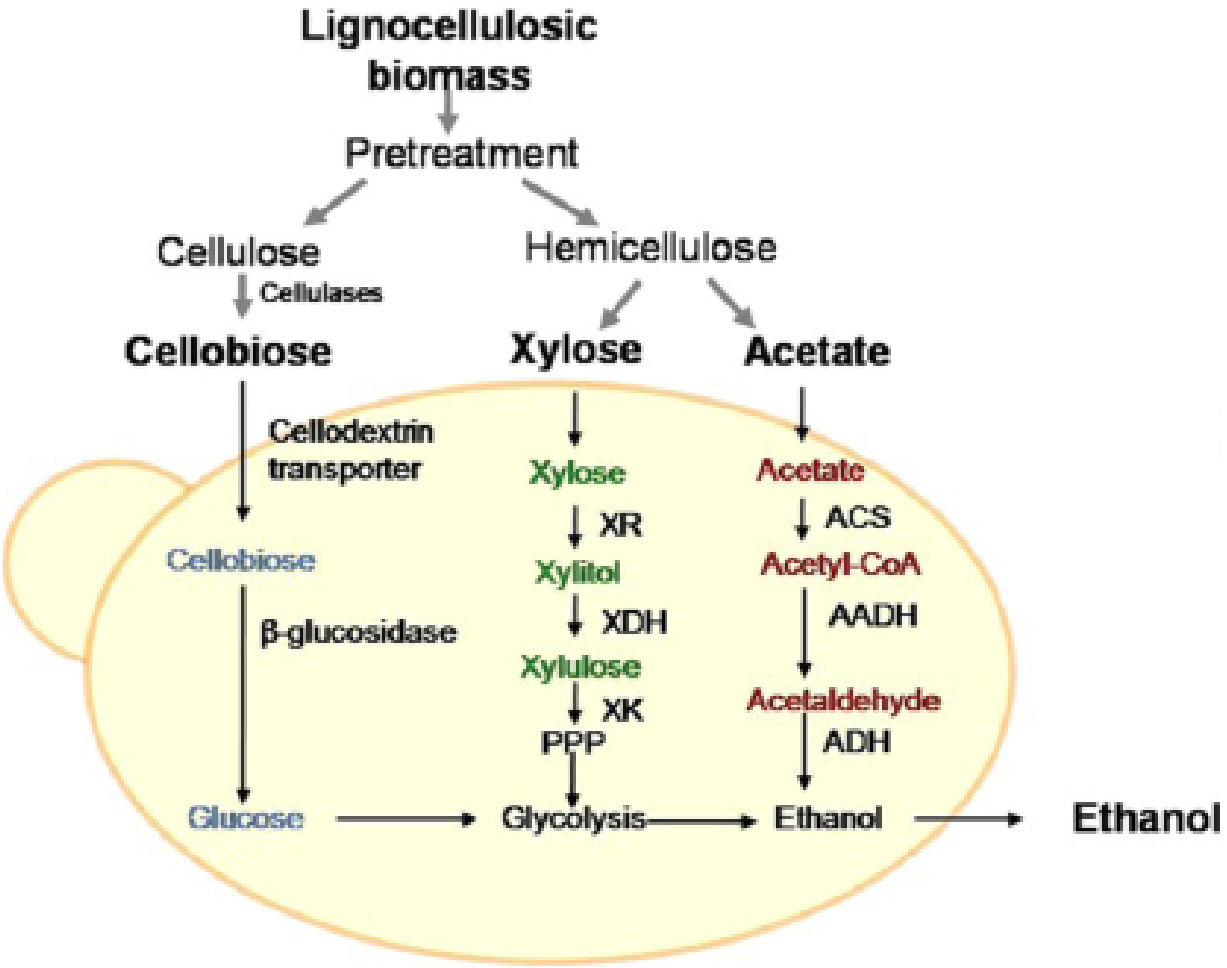


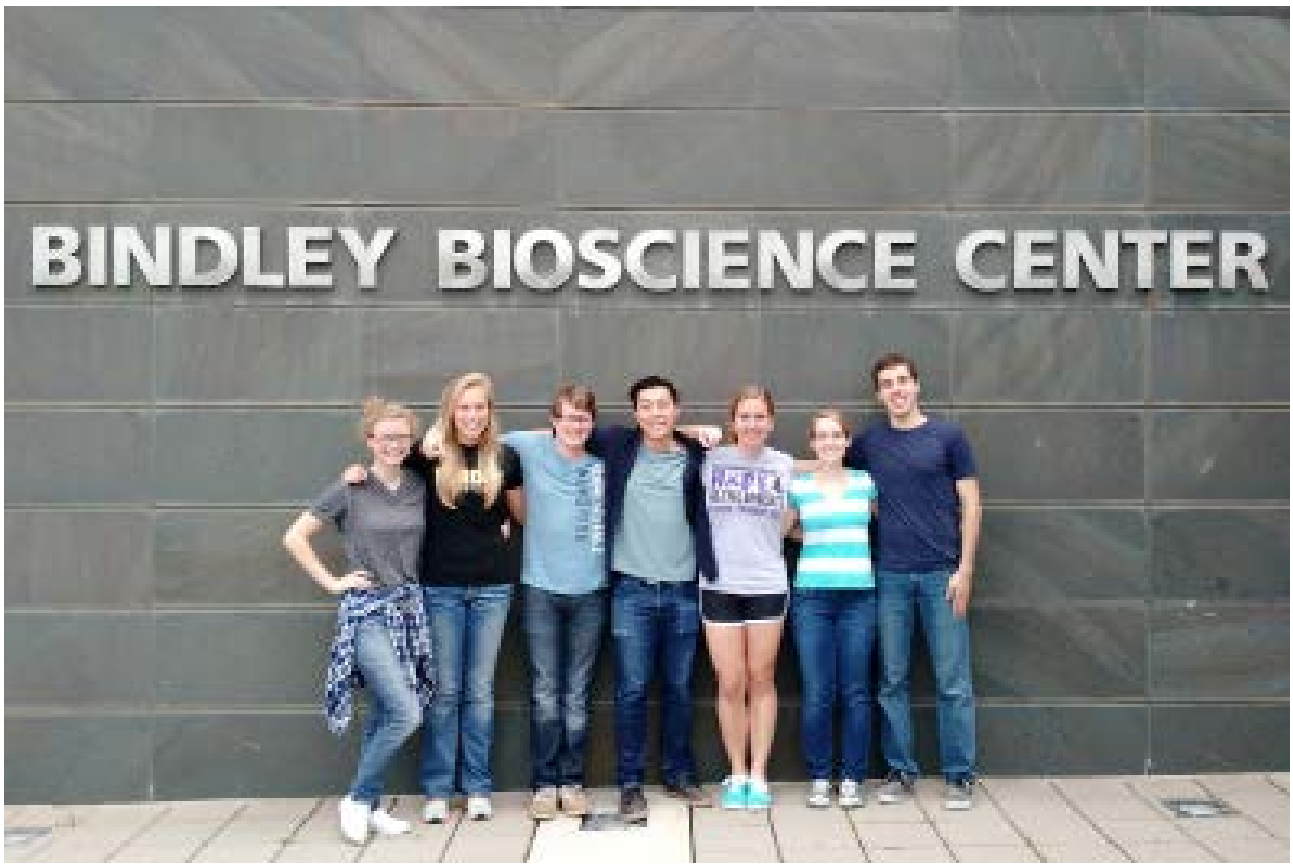
Figure 1. Schematic overview of biofuel production through coutilization of cellobiose, xylose, and acetic acid from lignocellulosic biomass by engineered yeast. XR: xylose reductase. XDH: xylitol dehydrogenase. XK: xylulose kinase. ACS: acetyl-CoA synthetase. AADH: acetylating acetaldehyde dehydrogenase. ADH: alcohol dehydrogenase.

Berkeley, and the Physical Biosciences Division of Lawrence Berkeley National Laboratory. More information can be found at http://pubs.acs.org/doi/abs/10.1021/sb500364q)

Current Objective

Currently, the Biomakers team has reduced their enzyme pool to the enzymes laccase, lignin peroxidase, manganese peroxidase, versitile peroxidase, tyrosinase, and Aldo-Keto reductase. They are testing the efficiencies of these enzymes by themselves and in combination.

In the end, the Biomakers team will also design and produce a cheap and functional prototype of what a new bioreactor would look like if it were to utilize an engineered yeast strain developed by the team with the J4-a strain. The prototype will be created from materials and instruments available to consumers in hopes that it may be used in developing countries that require more energy.



Left to right: Lexi Petrucciani, Kate Lowery, Bowman Clark, Arren Liu, Jill Osterhus, Melissa Robins, Mark Aronson.

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On And On And On – An update from iGEM Stockholm

(from Felix C. Richter)

For most lethal diseases, treatments and therapies are already available nowadays, which can prolong patients' life or even cure them completely. However, a major issue relies still in the way how we detect diseases such as cancer, as they are often diagnosed too late when the disease has already progressed to a state in which the patient's life expectance is already tremendously reduced.

We, from Stockholm with our ABBBA disease detection system, want to pioneer in a new biological detection method which would be able to detect many different diseases specifically and highly sensitively by exchangeable recognition cassettes. For this part we want to replace the signalling domain of an intrinsic membrane standing bacterial receptor (we use the osmo-sensor EnvZ) with a strong binder molecule, called Affibody molecule. Upon antigen binding, we want to trigger a signalling cascade leading to the production of an increased number of quorum sensing molecules which are recognized by our read-out strain activating the production of fluorometric molecules.

which are recognized by our read-out strain activating the production of fluorometric molecules. Since the project disclosure in early June 2015 in the Amoy iGEM Newsletter, we have been working hard on bring our vision into reality. As for all science, however, we needed to adjust our system due to material restrictions and new results in feasibility. As E.Coli represents the golden standard in the microbiological field and the iGEM competition, we encountered problems in the delivery of our antigen to the receptor located in the inner membrane. In order to make space for our antigen, we are currently pursuing the idea to make spheroplasts which are bacteria consisting only of their inner membrane. We are checking their capacity to drive gene expression after stimulation. Preliminary data showed that production of GFP under control of an inducible

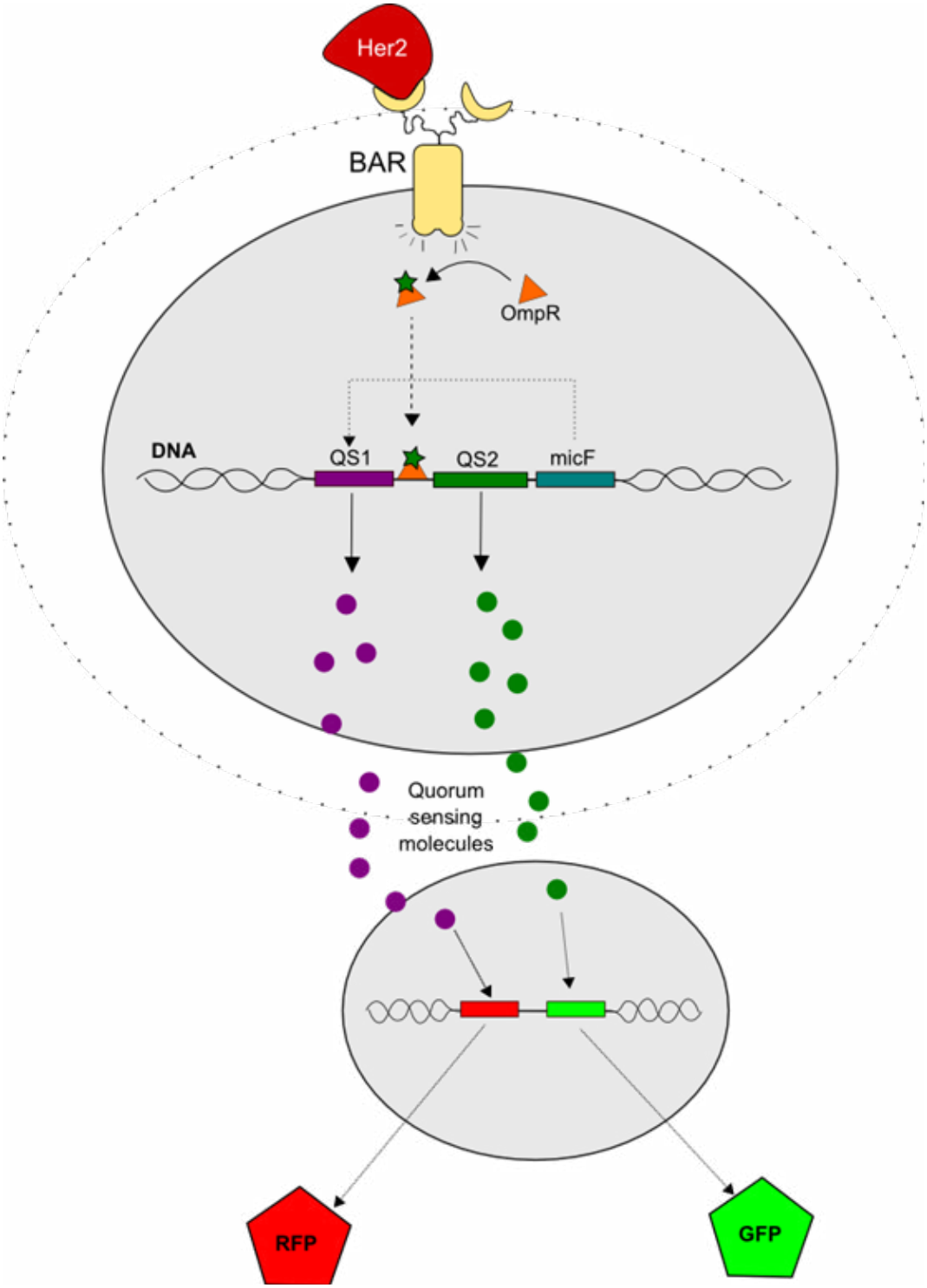

Figure 1: The Affibody-Based Bacterial Biomarker Assay (ABBBA), a novel tool for disease biomarker detection. The disease biomarker (here: Her2) can specifically and sensitively bind to the bacterial antigen receptor (BAR), a fusion protein consisting of an affibody binder molecule and a bacterial transmembrane domain, called EnvZ. The binding triggers the signal transduction into the cytoplasmic space allowing the phosphorylation of OmpR to OmpR-P which targets the promotor region of a genetic locus coding for two different Quorum Sensing Synthetases (QS1 and QS2) . These will be thighly regulated by OmpR phosphorylation, and introduce a switch in quorom sensing molecule secretion allowing a fluorometric read-out in a read-out strain. Depending on the quorom sensing molecule in the medium it will produce either one of two fluorophores (RFP or GFP). This switch in fluorescence will give us a clear and definite positive read-out upon biomarker binding.

promotor was not been possible at 25°C. Our group is currently evaluating other conditions to reproduce previously published data on gene expression in spheroplasts.

In regards to signalling, we are currently assembling the first reporter constructs for EnvZ signal induction coming from the inner membrane. Therefore, we optimized the induction protocol using a sucrose gradient to stimulate the osmo-sensor EnvZ.

The read-out part investigates meanwhile the "inducibility" of our read-out strain by another E.Coli strain which is secreting quorum sensing molecules. The first results were inconclusive and it seems that we need to adapt the current protocol to get an efficient induction of our read-out strain.

It is no waterloo that we are experiencing but challenges that we need and will overcome. Still many open questions and not much time to find an answer, but we will answer as many as we can to show that this diagnostic method is a potential tool for tomorrow's clinics.

Two last things in own affairs:

· Are you working with gram positive bacteria and you like our idea then contact us under igem.sthlm@gmail.com. We are currently seeking a strong partner for a scientific collaboration.

· Do you want to support our project financially? Then help us reach our crowdfunding goal. Even 5$ will help us realizing this project and sending students to the iGEM finals to Boston. Just follow the link to http://www.rockethub.com/projects/58524-bacteria-that-detect-disease-an-affibody-based-bacterial-biomarker-assay

iGEM 2015 team

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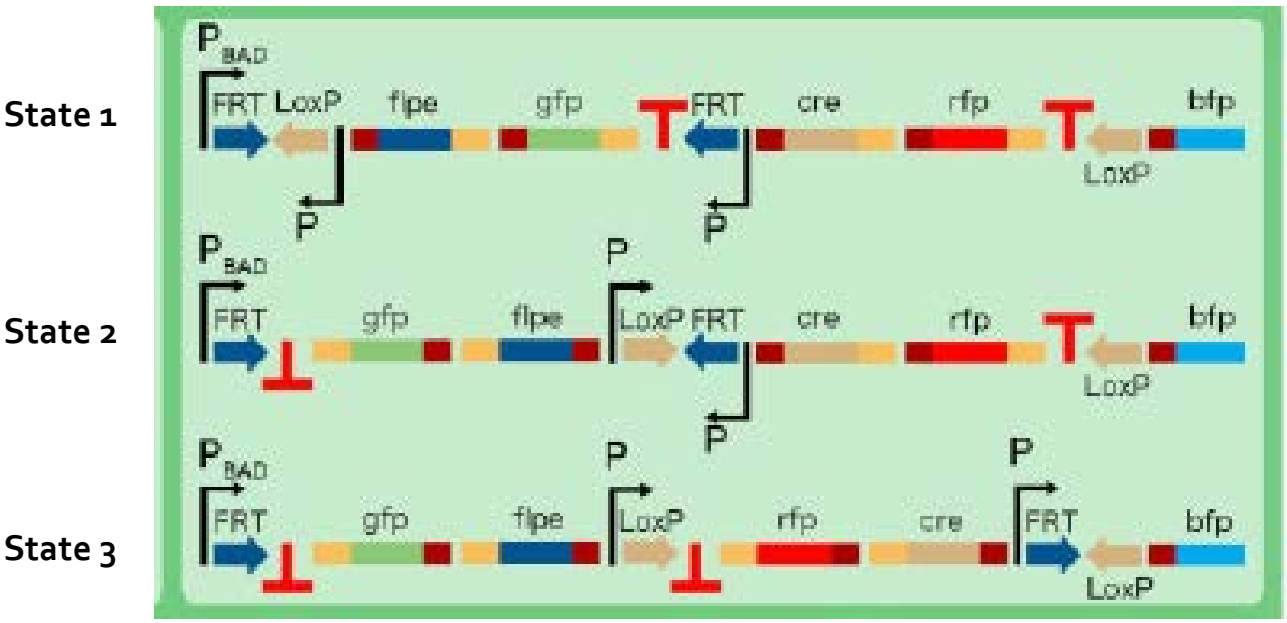
Micro-timer

Traditional biological research mostly focuses on rationales and functions, while nowadays, developing industries require commercialization and standardization. Consequently, we design our project on the basis of the wish of acquiring more intelligent bio systems. Micro-timer has a significant character that it lives in a time-stringent-cycle, which might be useful in different fields.

E.coli Timer

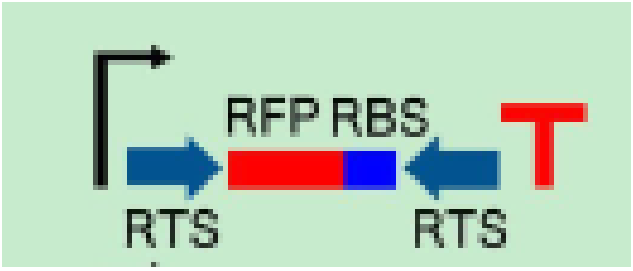
What we are trying to build is an E.coli rhythmic signaling system using DNA invertase counter. Cells containing this construct are pulsed with the inducer IPTG, and fluorescence would be measured over time. We anticipate that the E.coli can start counting and sequentially produce GFP, RFP and BFP in fixed periods of time after inducement. The counting process depends on the accumulation of invertase.

Our system is consist of 3 counters (shown as figure 1), sequence 1 is the original state, and only the first PBAD is forward. After induced, the first PBAD start transcripting flpe and GFP, when the quantity of flpe invertase reaches the threshold, the sequence between two FRT sites would be flipped, shown as state 2. Now, the state 2 sequence has two forward promoter PBAD, while the first counter is silenced by the invert, which cannot be expressed by the first PBAD promoter. Then, the second counter begin to express and accumulate Cre and RFP, then the sequence between two LoxP sites would be flipped same as described above. Eventually, only both two counters been flipped could the E.coli express BFP.



[Figure 1]

In order to find out the length of each cycle, we set a series of additional experiments. Shown as figure 2, the first sequence is designed to test whether the invertase could flip a sequence or not, only when the sequence flipped can the RFP be expressed. We also test the fusion protein of invertase and GFP, by detecting GFP signal, we can infer the length of one flip cycle.



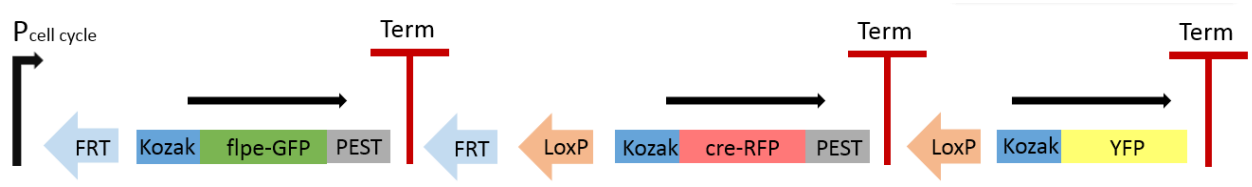
[Figure 2]

Yeast Timer

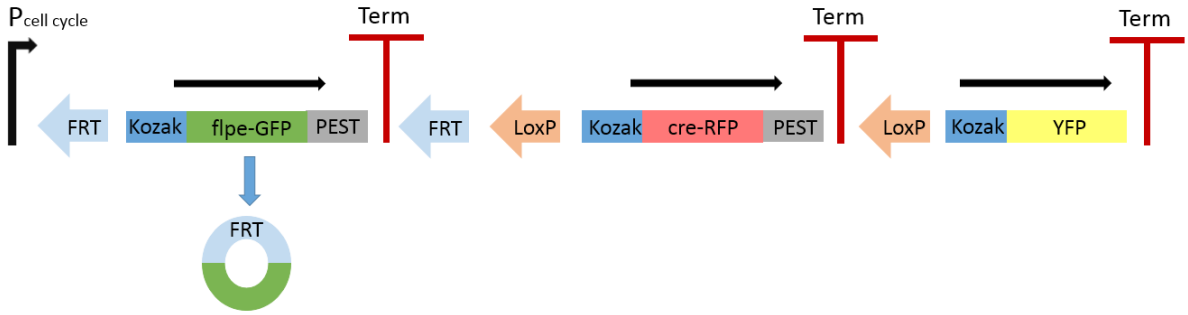
Using E.coli might be easy, but how about the yeast? As an age system, it would be impossible to use plasmids, so we need to modify and integrate its genome. We managed to design a multi-site integration. Besides, yeast has its own mitosis system, so we can make use of it when designing the age system, which is more accurate, instead of depending on the accumulation of invertase.

We tried to build a telomere-like system.

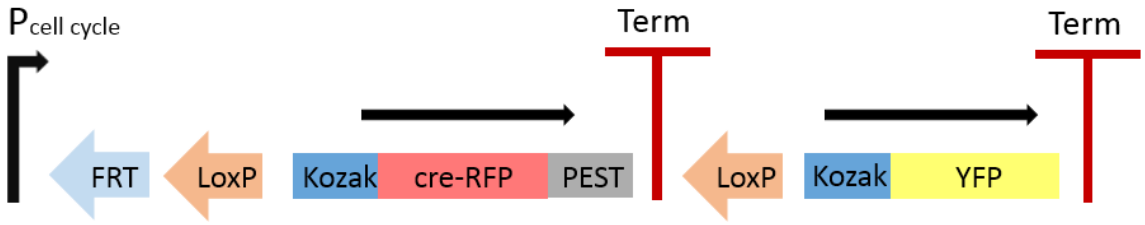
Yeast timer 1.0



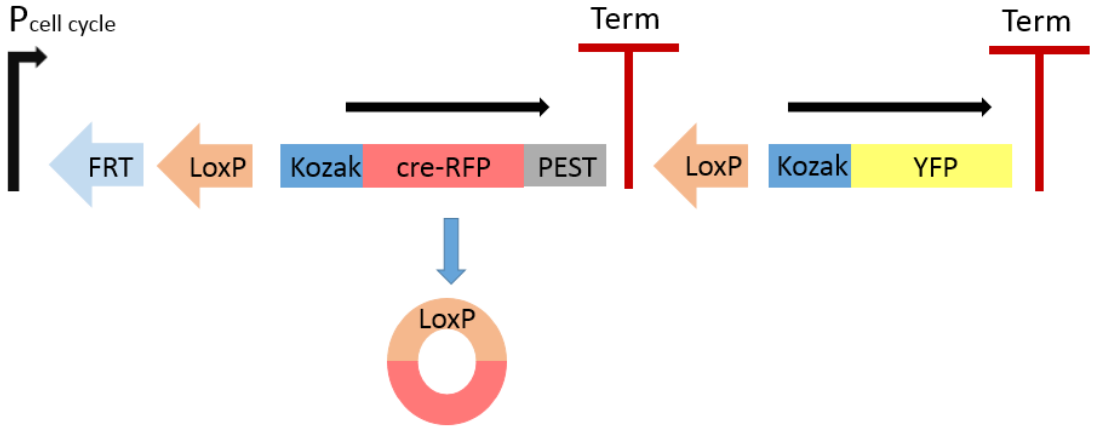
In state 0 (before the cell division), none of the signal will be express. The integrated sequence remain intact.



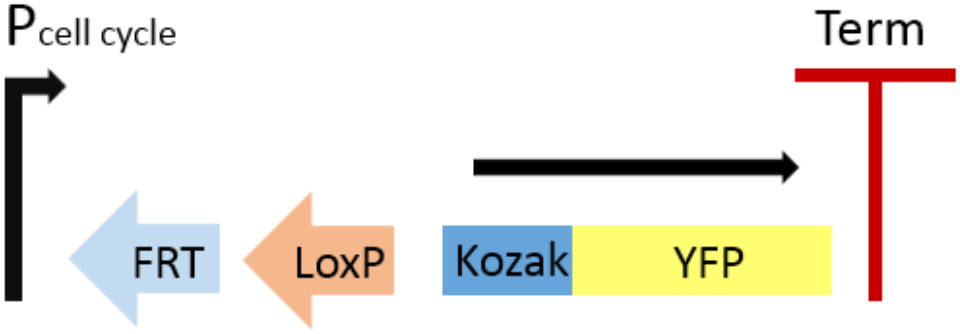
At the first cell division, the cell cycle specific promoter can initiate the expression of recombinase 1 fused with GFP, which can induce the recombination between two FRT sequences. Consequently, the specific sequence flanked by two direct FRT will be deleted, forming the following state 1.

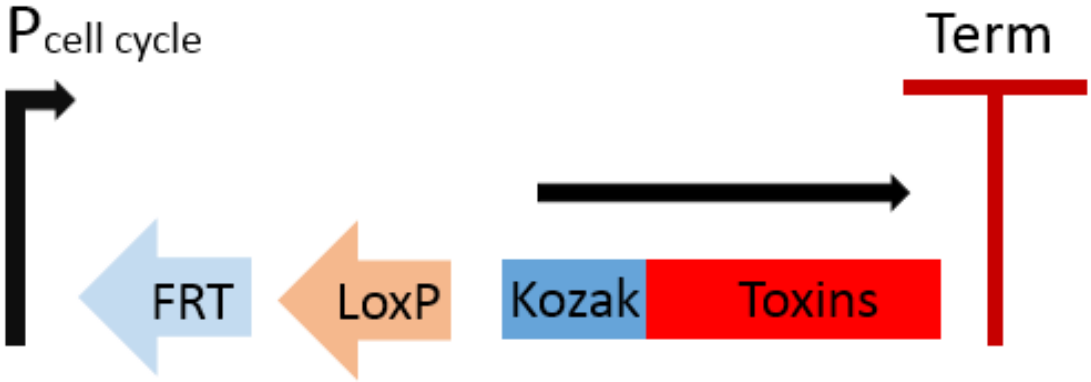


In state 1, the terminator 1, which can block the transcription of cre-RFP RNA at the former state has been deleted.



At the second cell division, the cell cycle specific promoter can initiate the expression of recombinase 2 fused with RFP, which can induce the recombination between two LoxP sequences, and the specific sequence flanked by two direct LoxP will be deleted, forming state 2.

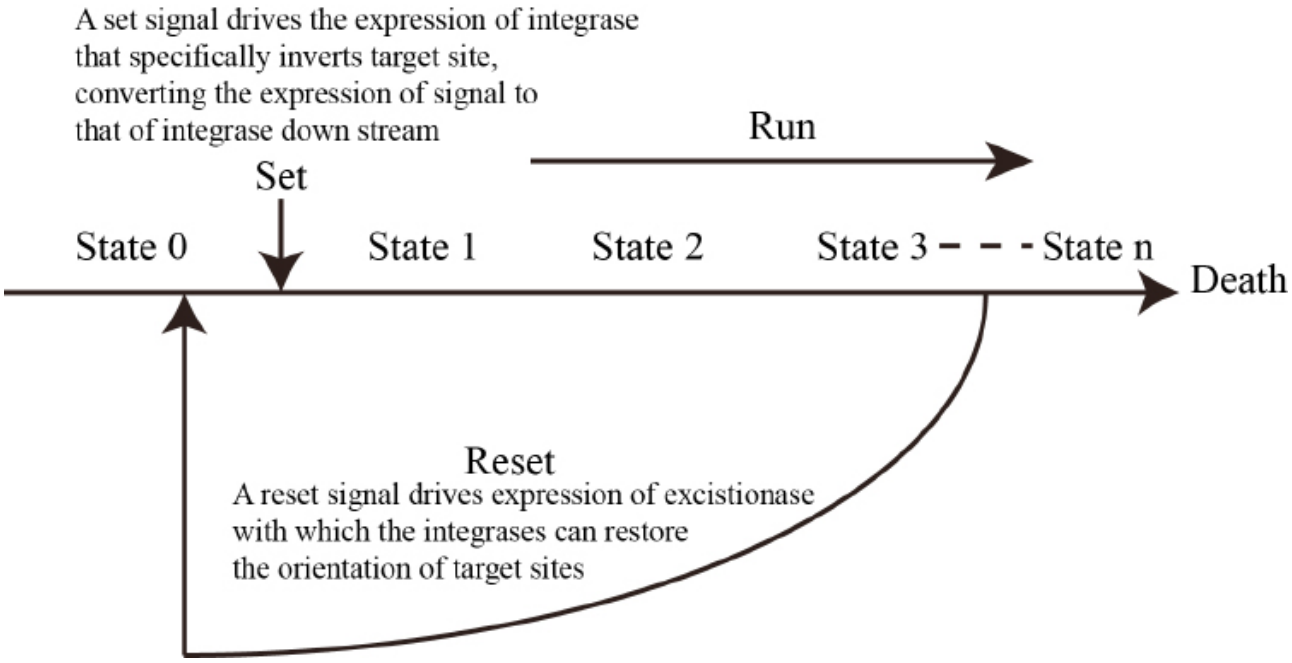


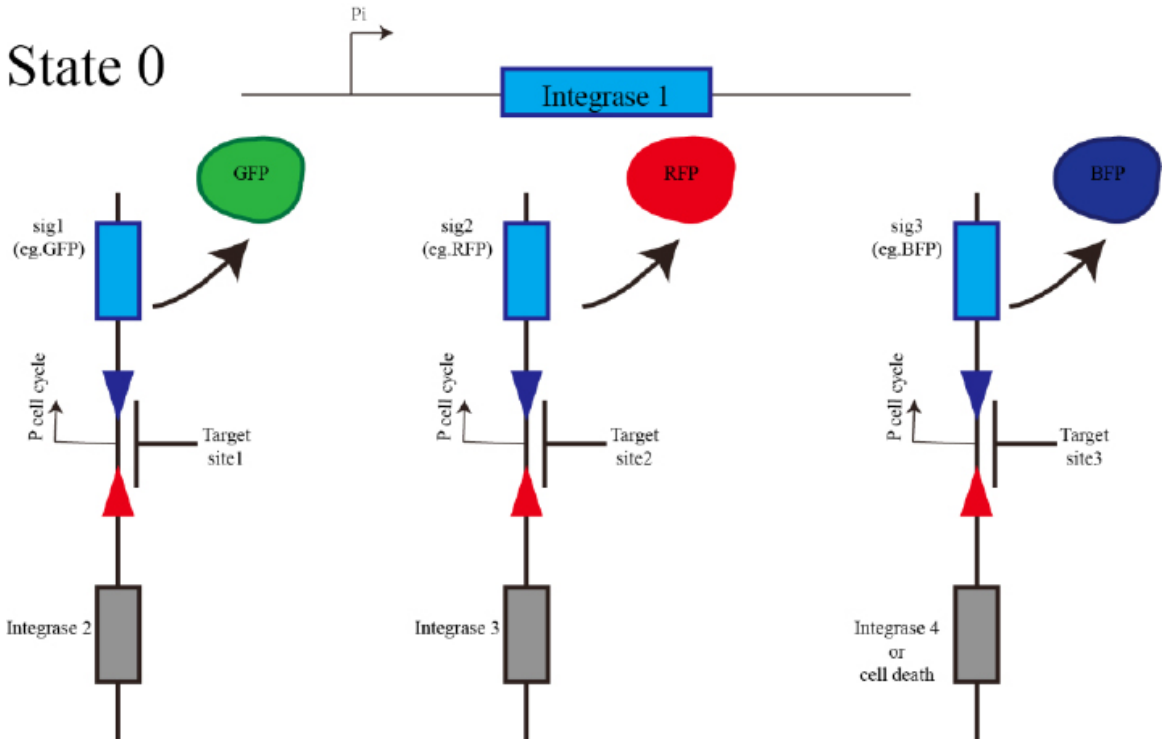


If we substitute the YFP gene with cell toxin gene, the initiation of cell cycle specific promoter can induce cell death. With every cell division, this device will sequentially truncate a part of the sequence, and finally lead to cell death, working like telomere.

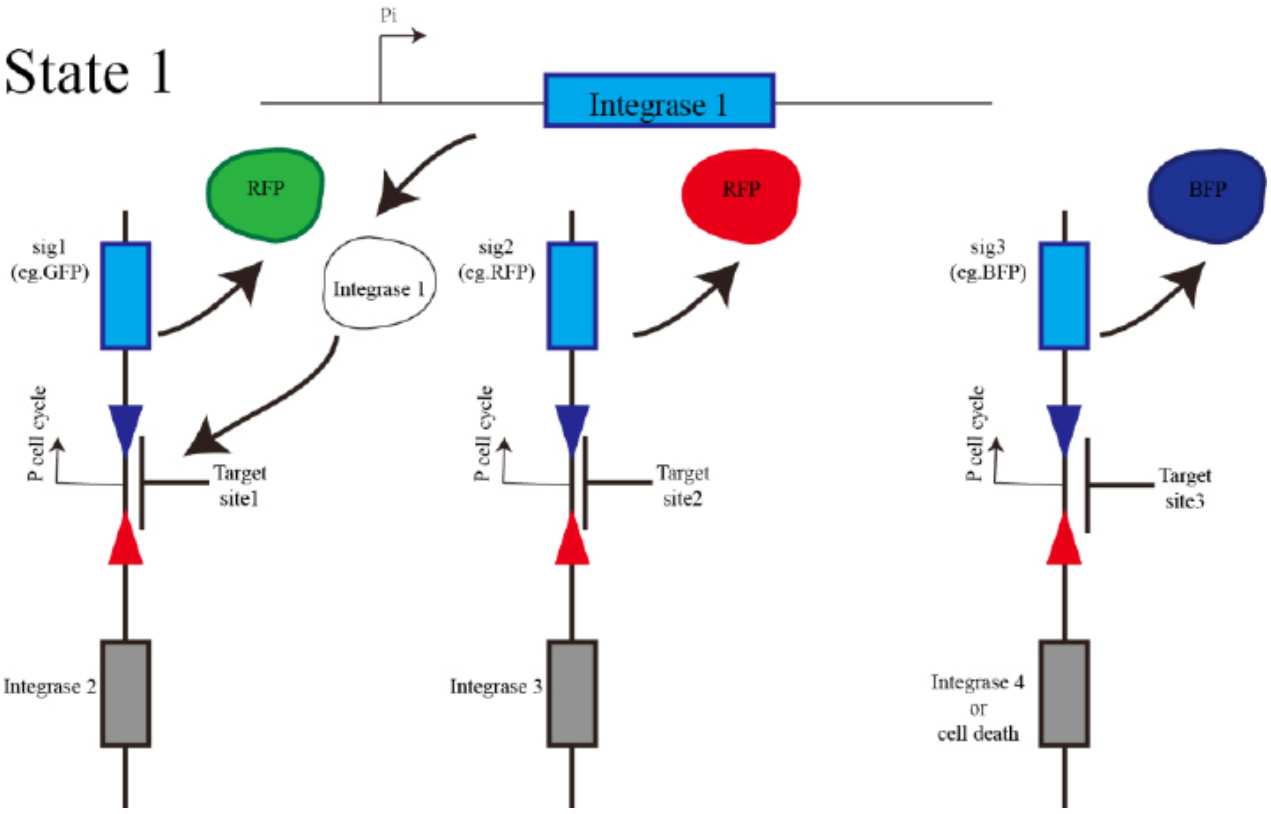
Yeast timer 2.0

We are trying to build a mitosis-linked expression system. The rationale remains the same, but in this engineered yeast, people can change the inserted gene and chose the expression periods. If insert a toxin gene, we would acquire a yeast suicide system.

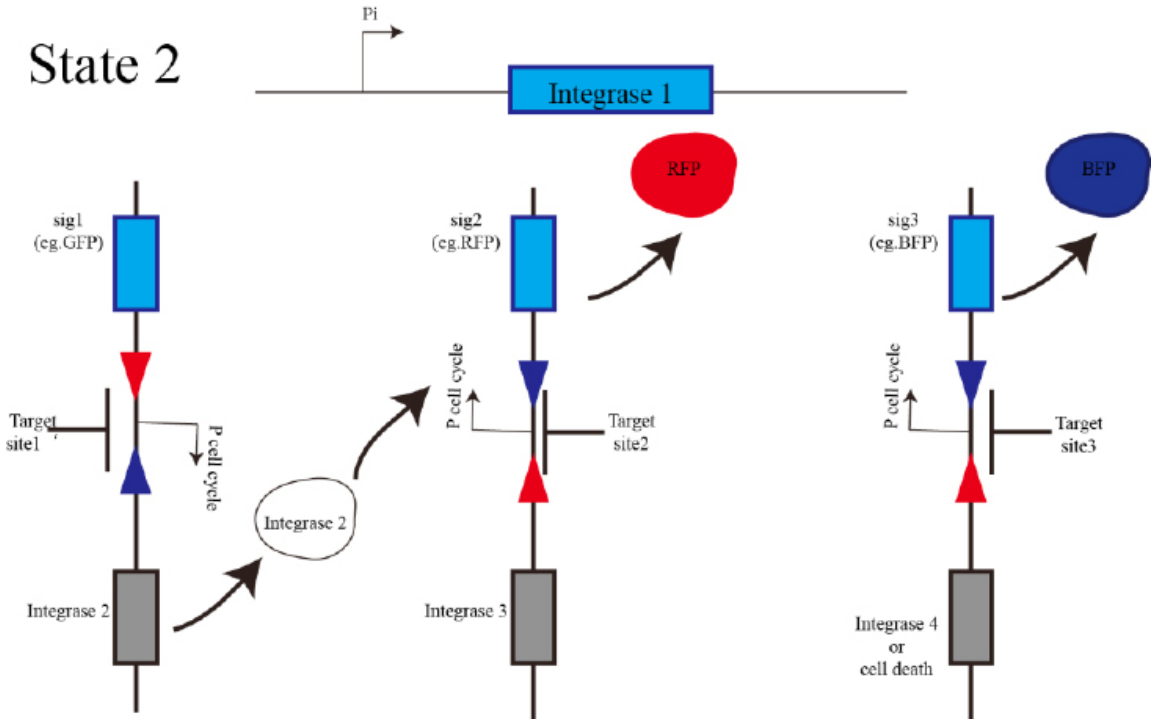




In state 0, all the signals are expressed
And when we add inducer to express integrase1, the system starts.

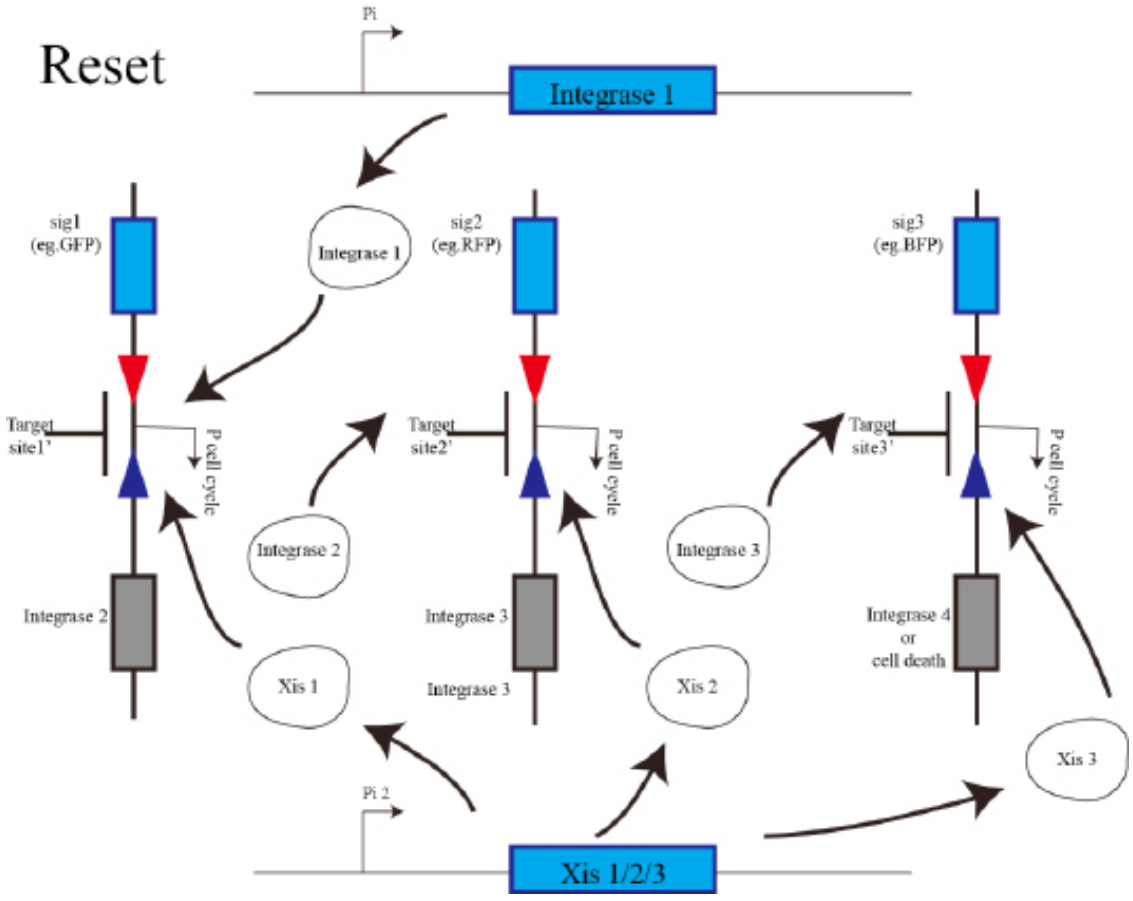


In state 1, integrase 1 is produced to attack target site 1, forming the state 2



In state 2, target site 1 was inverted and thus signal 1 was silenced whereas integrase 2 is expressed

....and to state n.....if we do not want it to work any longer, just let it to be dead....but....



We can add another inducer, producing excisionases to restore the orientation of target sites. The system can be back to state 0 and start after a short period.

iGEM 2015 team

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iGEM Team Tec-Monterrey

Our project consists in introducing a biobrick toolkit for the use of Sf9 cells. Sf9 cells are insect cells that come from Spodoptera frugiperda, the Fall Armyworm. The great thing about these cells is that they are more similar to mammalian cells, so you can do glycosylations and other posttranslational modifications better than in other organisms, for example, comparing it to bacteria or yeast. They are also less costly than using mammalian cells, and are easier to manipulate.

There are two main ways to manipulate the production of recombinant proteins in Sf9 cells. The first way is through the production of a recombinant baculovirus. This recombinant baculovirus is produced by the transfection of a recombinant bacmid (previously produced in E. coli) in Sf9 cells, and produces your protein of interest for around 5 days. The second way is through the development of a stable line. The actual way to produce a stable line is through selective pressure, which means that the cell is transfected with any plasmid with an antibiotic resistance, and during the next month, the cell is forced to integrate the plasmid in its genome by applying the antibiotic during the whole month (it can be with a continuous concentration or in increasing quantities).

So far, we finished the design of the project, as we plan to do both ways of production. We are still waiting for the material to be sent to our lab, so we started by participating in the Interlab Measurement Study. We are very excited with our project, because we have never before used these cells, so we can't wait to start having fun and learning to manipulate them.

Our Team

After a careful recruitment process to select the team members, the iGEM TecCEM Collegiate team is comprised by 15 bachelor students and one faculty instructor of the ITESM CEM University in Mexico City. Our team features students of Biotechnology Engineering, Mechanic Engineering and Mechatronics Engineering, making it an intense multidisciplinary work area. This year's competition will be the second time our University participates in iGEM and attends to the Giant Jamboree, and given our colleagues of iGEM TecCEM 2014 pioneered synthetic biology on our University, we feel both excited and responsible for continuing such an important task. Since last November, we have been working hard going through several problems and project ideas analyzing their feasibility and impact. At the beginning of 2015, after several intense discussion sessions, we finally decided for a novel and interesting proposal! If you have any questions or want to know more about us, please don't hesitate to write us or contact us!

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iGEM 2015 team

TecCEM

Our project

A concerning issue that has been noticed in Mexico City, particularly at Lago de Guadalupe in the State of Mexico, is the pollution of water bodies by heavy metals and their associated salts. Ionic lead, for instance, has been proved to pose great danger for human health, and the levels of exposure in Mexico remain in critical levels. With the above in mind, the iGEM TecCEM Collegiate 2015 team is trying to address this matter due to the lack of low-priced and cheap methods for water remediation of ionic lead available nowadays. Our particular interest on nanobiotechnology made us come across a novel technique called DNA Origami which allows the design of DNA nanomolecules based upon the fact that nucleic acids can fold specifically into complex tertiary structures according to their sequence of nucleotides. Knowing that DNA can be considered not only as genetic material but also as a biopolymer, coupled with aptamer studies, gave birth to our project "A nanobiotechnological approach for water remediation" which consists in designing a DNA nanomolecule of a desired conformation that is functionalized by lead-specific aptamers. Join us in Boston at the Giant Jamboree for more details and results on this project!

[Team - TecCEM]

iGEM 2015 team

TecCEM_HS

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Our Team

This is the first High School Team from the State of Mexico to ever participate in an iGEM competition, our team is composed by 10 high school students of Tecnologico de Monterrey in Mexico.
These 10 students are very committed on creating a project that can help the community in which we live, so we can see and understand the direct impact our project would have on us. We have been working since January to develop our project and we have been working a lot in the experimental and theoretical area of synthetic biology because for most of us, this was the first

[Team - TecCEM_HS]

time we even heard of it. Thankfully, the Undergrad Team from our school is mentoring us and helping us understand how iGEM works and how we can achieve our goals to present them at the Giant Jamboree! Also, we have three incredible instructors that are PhD in Biotechnology and Immunology, as well as Bioprocesses.
We are very excited to be competing with older students that have more experience, we look forward to meeting all of you!

Our project

Lago de Guadalupe is the most extensive water body in State of Mexico, Mexico. It is surrounded by industrial, agricultural and residential areas, the last one being responsible for 25% of the total contaminants, among these is SDS (sodium dodecyl sulfate), which is the principal component of detergents used in households. The residues of detergents change the water's pH, turning it into a toxic and dangerous environment for more than 150 species that depend on this lake. Although this lake has been studied for its treatment and to obtain better levels of water quality, nothing has been achieved. Our project will consist in developing a bioremediation system using synthetic biology, to lower SDS levels in the water.

TecCEM HS

iGEM 2015 team

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Our Project - Janus

Have you ever heard of the god of beginnings and transitions in ancient Roman myth? He is Janus, who is usually depicted as having two faces, since he looks to the future and to the past. Our project is focused on another Janus, a kind of protein, who looks to the hydrophilicity and to the hydrophobicity. Its scientific name is hydrophobin.

Hydrophobins are proteins that are produced by filamentous fungi. They are characterized by having a hydrophobic patch on one part of the surface. Just because of this, a sea of possibilities are opened. Our project is mainly focused on its modification and new applications.

1. Protein Modification

Natural hydrophobins couldn't be expressed by E.coli because of error of fold. However, it really restricts its broader application. To improve this condition, we re-designed the structures of two kinds of hydrophobins, making expression in E.coli possible.

2. Protein Chip

Another amazing characteristic of hydrophobins is that they are able to assemble spontaneously into amphipathic monolayers at hydrophobic-hydrophilic interfaces. Thus, we take this advantage to make a high-flux tumor detection chip. In this process, they could act as a medium in antibody-fixing by electrostatic force, which not only ensures the activity of antibody, but also improves the detections' accuracy rate.

3. Stimulate Plastic Degradation

Enzymatic hydrolysis of plastic has a broad developing prospect, however, the rate of

JANUS
TIANJIN UNIVERSITY

hydrolysis is low due to many reasons. Some research has published that the cutinase degrading plastic could be enhanced by hydrophobins. In our experiment, we make them into a fusion to test if the effect could be better.

4. Protein Extraction

Because of hydrophobins' amphipathicity they could be used as a special purification tag for protein, and the purification system could be as simple as oil and water. With help of this, we could even achieve the recycle of enzymes used for plastic degradation.

The Team

Hello world! We are Tianjin iGEM from Tianjin University. Two years ago our school of life sciences was built up and this team mainly consists of their students, plus students majoring in engineering. New instructors, new team members, new field... will we create something novel and amazing? Let's see.

[Team - Tianjin]

iGEM 2015 team TU Eindhoven

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The problem

Our gastrointestinal tract is packed with up to a 100 trillion microbes. On a cellular level, these microbes outnumber us by 10 to 1 (1). This life-sustaining microbiota assists in producing essential vitamins and the digestion of certain nutrients. To survive within our guts, symbiotic (read 'friendly') bacteria secrete small molecules to convince the immune system not to attack them (2). This communication can be seen as one-way-traffic, but the possibility of making it bilateral is interesting to say the least. If bacteria in the gut could sense the state of our immune system, pathologies such as Crohn's disease, intestinal cancer and even neurological diseases such as Alzheimer's could be discovered early (3)(4).

Bilateral communication requires a signaling pathway in bacteria responding to cytokines. However, no such pathways have been elucidated within the bacteria themselves (5). Therefore, it is necessary to develop an artificial pathway. A first step towards such a signaling pathway is the development of signaling proteins which can sense cytokines, the intercellular signaling molecules.

Our device

The bacteria that we are developing have signaling proteins, which consist of three parts, 1) a sensory domain, 2) the membrane protein domain and 3) the intracellular signaling protein domain. In order to achieve modularity, we will use aptamers as our sensory domains. These aptamers are oligonucleotides which bind specific target molecules and can be clicked upon the membrane proteins using click chemistry [6]. The presence of ligands can bring two signaling proteins in close proximity (see Figure 1). To actually conduct a signal, existing signaling protein

domains can be fused to the inner side of the membrane. In this way, naturally occurring signaling pathways can be harnessed to conduct the signal.

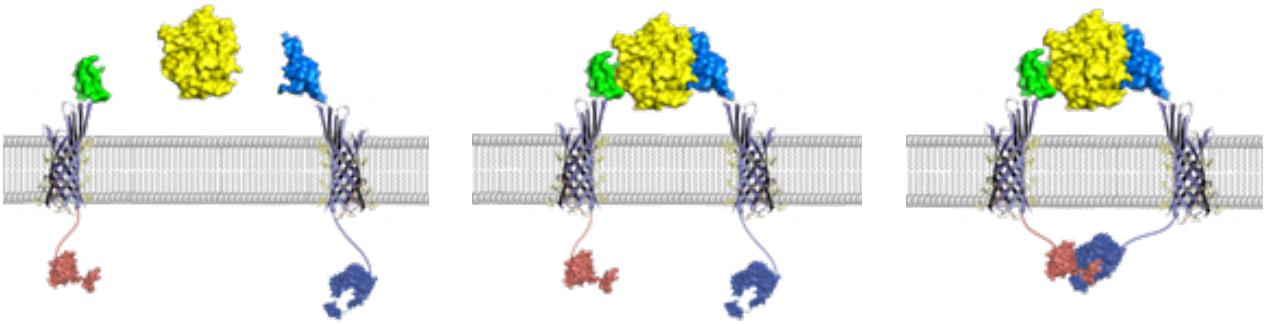

Figure 1 – Conceptual representation of our device. In the presence of a ligand (yellow), the mutual distance of the complementary signaling proteins (green and blue) will be reduced. The resulting proximity of the intracellular signaling protein domains (red and blue), results in the transduction of a signal.

Experimental approach

To verify whether or not the presence of ligands increases the proximity between the two membrane proteins, we will start out by fusing the membrane proteins to luciferase domains and fluorescent protein domains, exploiting the naturally occurring Bioluminescence Resonance Energy Transfer effect. As aptamers, we will be using thrombin aptamers. We believe that this approach is most viable since thrombin aptamers have been previously used at our university and have become the showpiece of the scientific community when it comes to aptamers.

Applications

Due to its inherent modularity, the system can have a wide range of applications. Ideally, any ligand for which an aptamer is available could be detected using the system. A particular application we have in mind is the use of the system within the gastrointestinal tract. The device could be used to elucidate the relationships between our immune system and certain pathologies. This application could eventually result in functioning as a diagnostic tool.

Another future application goes beyond functioning as a mere readout tool of the gastrointestinal environment. Since the device triggers a cellular response, the bacteria could for instance act upon the shortcomings of our immune systems, including alleviation of detrimental immune responses associated with Inflammatory Bowel Disease (IBD) and gluten intolerance. One could also think of symbionts that could support or enhance the digestion system by excreting lactase in order to treat lactose intolerance.

Prospects for the summer

At the moment, we are putting the last hand at our DNA constructs and almost ready to order our DNA, bacterial strains and cloning kits. We hope to be able to finally make use of our lab authorization soon after! Next to the experiments, we have to clear a lot of additional bars to make a success out of our iGEM project. One of these bars is collaborating with other iGEM teams. Currently, we are looking at compiling a cloning guide for future iGEM teams. In this guide, we will be discussing the numerous available cloning methods (including but of course not limited to BioBricking). We hope to feature the cloning experiences of other iGEM teams within this guide. We hope many of the teams which contribute to this newsletter will also be able to contribute to this guide. Please do not hesitate to contact us!

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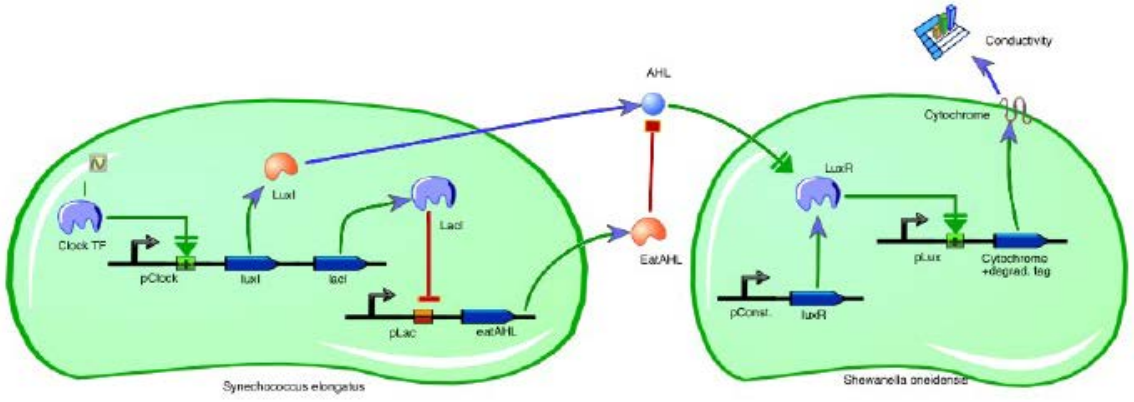
Our Project

We are currently working on a bio-digital clock as a proof-of-concept project dealing with the integration of biological and electronic circuits. We plan to modify the circadian clock KaiC protein system of cyanobacteria Synechococcus elongatus by hooking it to the AHL-producing part of the Lux quorum sensing system of Vibrio fischerii. The sensing portion of the Lux system will reside in modified Shewanella oneidensis, engineered to produce changes in its electrical resistance in response to changing levels of AHL by controlling the cytochrome production. Both the circadian clock of S. elongatus and the electrical regulation of S. oneidensis have been worked on separately by previous iGEM teams, however, we shall improve on them by incorporating feedback control systems to reduce their response time. Finally, another key component of our project is the design and construction of the electronic hardware necessary to measure S. oneidensis's change in electrical conductance, and the interface between the biological circuit and any electronic circuit it is to be coupled, which in our case is a digital clock. The following figure shows in detail our circuit for this year's competition.



iGEM 2015 team

USTC

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Email: yjt2013@mail.ustc.edu.cn

Trace Antibiotics Detection and Measurement(TADM)

Better for public health and environment

[Team - USTC]

2015 USTC iGEM

In China and other developing countries, abusing antibiotics causes severe antibiotic substances contamination and antibiotic resistance issues.

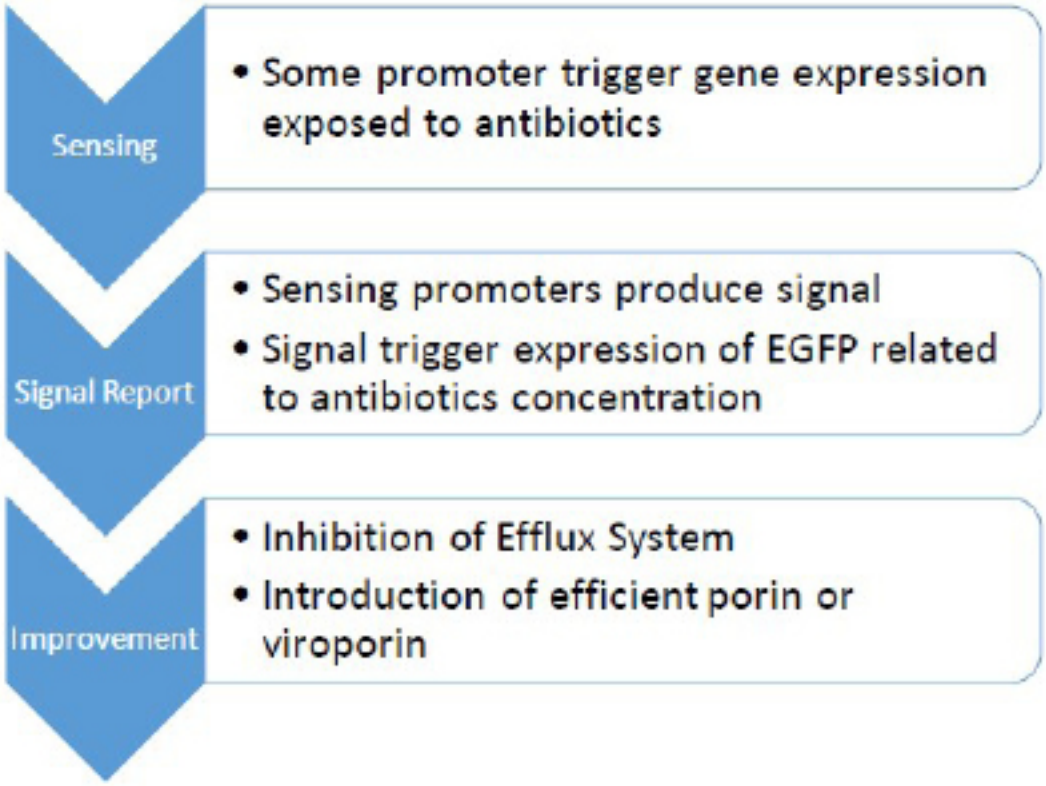
China hasn't recognized antibiotics as a factor of water quality. Due to the lack for an efficient way to detect and measure and the absent of a specific emission standard, emissions of the factories that produce antibiotics have been loosely controlled.

Our project aims at detecting trace antibiotics in natural water bodies and measuring their accurate concentration, using synthetic biology methods, in order to help us better understand the current status of antibiotics contamination and promisingly inspire us some thoughts on how to solve current problems.

Antibiotics concentration in trace class is hard to detect with some complicated physical/chemical detection way. Fortunately, we find that antibiotic resistance bacteria, themselves hold capability to sense antibiotics and make reactions. So making use of those bacteria, we could build an antibiotics detection device with lower cost and higher efficiency or fast response.

Strategies

1. Strategy I: Improve sensing capability



(1)Sensing

In this part, we attempt to find some promoters that will efficiently response to antibiotics. Those promoters mostly origin from antibiotics resistance bacteria. We search promoters which match our conditions on iGEM Registry and through other channels. We now have already selected some.

We will go on searching fitting promoters as many as we can because we don't know which one will successfully achieve desired effect. And next step is to figure out their sequences

(2)Signal amplification

In this part, we plan to include a signal amplification system, intending to amplify sensing promoter's response, so that the diffusion of the autoinducers from Cell type I to Cell type II can be guaranteed and the signal can be detected eventually by our non-biological system.

We intend to integrate a secondary cascade circuit or a three-level one because of their satisfactory character.

(3)Permeability improvement

In this part, we have two ideas to achieve our goal. One is to inhibit the efflux system to let less antibiotics out. The other is to overexpress porin to allow more antibiotics in.

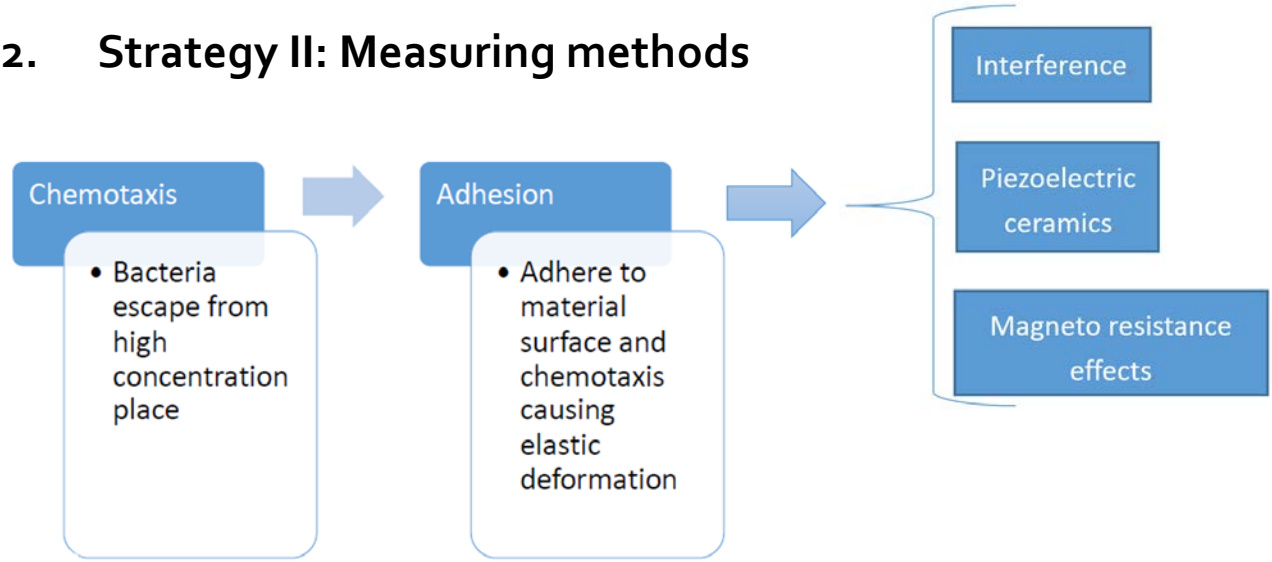
(a)Inhabit efflux system by CRISPR/Cas9

CRISPR/Cas9 is a novel technology which has many applications. In our project, we use it to knock out the gene that controls the efflux system.

(b)Overexpress Porin or Viroporin

We will overexpress porin, OprF and viroporin, SCVE to better improve the permeability of our engineered bacteria, more probability to receive these small molecules.

2. Strategy II: Measuring methods



(1)Chemotaxis

Chemotaxis is the movement of an organism in response to a chemical stimulus. Bacteria direct their movements according to certain chemicals in their environment. This is important for bacteria to find food or flee from poisons.

Using this characteristic, we can design a system which makes bacteria move to a certain direction when antibiotics are detected. Meanwhile, our modeling group can figure out the distance-antibiotic amount function. With that function, we can measuring antibiotics quantificationally.

(2)Adhesion

We designed to include a membrane, possibly polystyrene or alkynyl polypropylene, which bacteria can adhere to.

Using that membrane, we can make bacteria's chemotaxis more measurable.

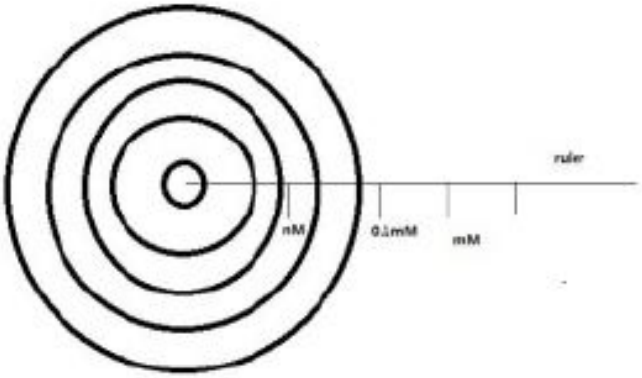
To achieve the adhesion, we make use of a system which makes bacteria to express adhesive which anchored to their cell membranes.

(3)Measuring methods

We now have three ideas on how to detect and measure the tittle displacement of the above-mentioned membrane. However, there still remains a lot problem to be settled. So we can just briefly share our idea at present.

(a)Interference

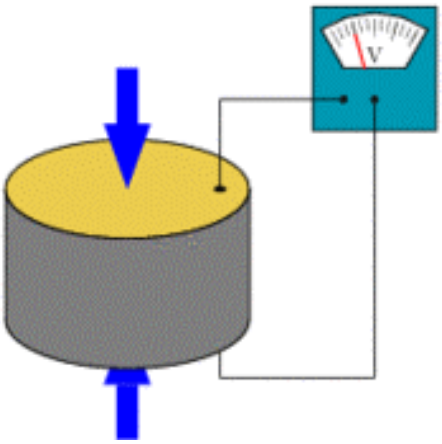
We find interference is promising for the final measuring. It is well known that interference can form Newton rings, so our method is to use a single beam of light to irradiate on the membrane and get a Newton ring image. If we put scale marks on our receiving device ahead, then different rings on different marks may represent for certain shape changes of the membrane.



(b)Piezoelectric ceramics

Piezoelectricity is the electric charge that accumulates in certain solid materials (like ceramics) in response to applied mechanical stress.

Apparently, with th e help of some amplifying designs, piezoelectric ceramics can be used to detect and measure the displacement of the membrane.

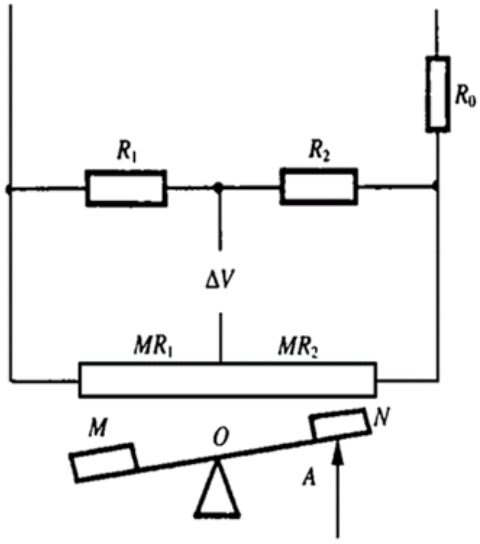


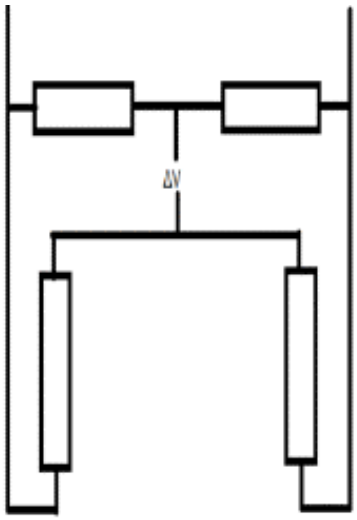
The current problem of this idea is that the signal that our device receives may be too weak to be useful, even when amplification is already done.

(c)Magneto resistance effects

We have learned that the magneto resistance of certain semiconductors can be very sensitive to their shape change. Using that characteristic, we can figure out a MR-MSC function. (MR: Magneto resistance; MSC: Membrane shape change)

A circuit diagram of a former application has been showed below





Based on that diagram, we add some changes to it to suit our project better.

Here below is our design.

All in all, our project has two main strategies which can be simply summed up as sensing and measuring.

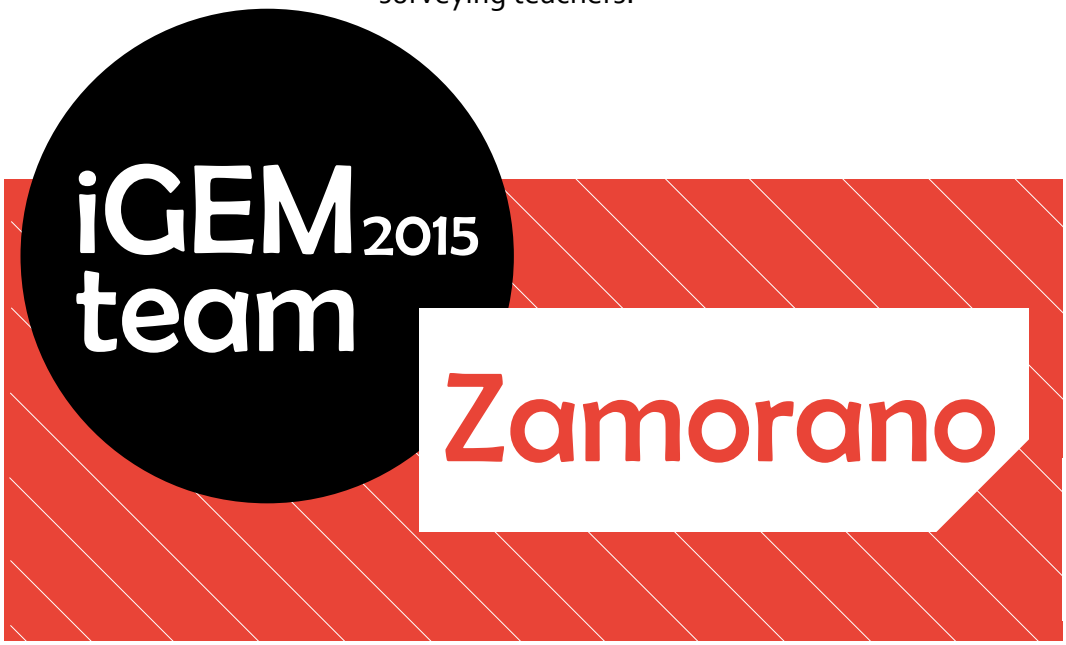
In the first part, our goal is to set a strongly sensitive sensing system along with an effective signal amplification system.

In the second part, our goal is to find an accurate device to receive and present the signal, and then to figure out a model to correspond the final signal to a certain concentration of the antibiotics.
Though there are lots of problems waiting to be settled in our project, we still firmly believe that it is promising and useful, and that it will work out eventually.

2015 IGEM Zamorano Project

As we mentioned during the last newsletter, our project for this year is a biological insecticide. For the chassis, we are going to be using an E. coli. There are three main components for the bacteria. First, we are going to be using the pheromone PBAN created by NCTU Formosa last year. This pheromone is used to attract the insects, which includes a large variety of species, to the trap. We already made contact with the Formosa team who are helping us sequence the biobricks and will send them to us expectedly. The second part to the bacteria, is a biological adhesive created by Tu-Delf on 2011 that will be used to keep the insects inside the trap once they have been attracted by the PBAN pheromone. And last but not least, we are going to be extracting the AaHIT toxin from a scorpion to exterminate the insect or plague. This last part has not been tried yet, but has been talked about on scientific papers from Santiago Haase.

All of this without leaving behind policies and practices which is what brought us to IGEM to begin with! We are going to be working on the risk assessment for our bacteria, this time assessed by an expert on the field. We are also going to be working on surveys to know the public's perspective on synthetic biology. This time around, though, the survey has a different demographic target. We are going to be surveying teachers.



Complementary to this, we are going to be organizing a course on Synbio given by the same expert who is going to be assessing the team to build the bacteria. This course is targeted to the alumni population of Zamorano to teach them the basis on synthetic biology and expand their knowledge and creativity to think how they can implement synthetic biology in their fields of study.

With our project this year we are not only hoping to solve plague problems for different crops, but also eradicate vectors of serious disease such as malaria, chinkungunya, and dengue fever, among others. With this we are hoping to benefit not only local producers, but also communities with a product that will have little to no impact on the environment since it is one hundred percent biological.

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Interview
By Paris Bettencourt

Interview

Hi everyone!

The Paris Bettencourt team is glad to present you Jake Wintermute, one of our advisors, coming from the United States.

- **What is your background?**

I'm a postdoctoral researcher at the CRI. I also teach introduction to Synthetic Biology for the first year master's students.

- **Why did you choose synthetic biology? What has interested you?**

I like how Synthetic Biology exists in between basic and applied research. We can use it to understand why existing biological systems work so well. Or we can use it to make new systems to help people or make money.

- **If you were to define synthetic biology in few words, what would you say?**

You have to think of synthetic biology like engineering. We focus on specific problems, and then solve them using any tools, technologies or knowledge that we have.

- **What is your role in IGEM?**

I have been the main organizer for the Paris Bettencourt team for 3 years. This year, someone else will take on that role, but I am still around to support the team.

- **What is the best memory of your iGEM career?**

In August of 2013, the team set up speakers and a record player in the lab. It was very hot, and no one else in Paris was working in August. But the team spent many long hours together in the lab just hanging out, listening to music, doing experiments and thinking about science. It was the best time ever.

- **What advice would you give to the iGEMers this year?**

Focus on the data that you plan to collect. The natural tendency is to focus on the system that you plan to build. But it doesn't matter if your system works unless you can show it with data. By starting with the data and working backward, you will save time by building only constructs that produce useful data.

- **What do you think will be the future of synthetic biology in the next 20 years?**

DNA synthesis and assembly is moving very fast. In 20 years, we will be able to build any DNA molecule for a very low cost. But our understanding of how DNA produces function is moving much more slowly. We need the next generation of Synthetic Biologists to tell us what DNA sequences to build.

Human Practices

Human Practices
By Birkbeck

Human Practices

Putting the "fun" in "iGEM"

How to make the most of taking part in iGEM as a team

https://www.facebook.com/bbk.igem

https://twitter.com/bbkigem

http://2015.igem.org/Team:Birkbeck

BBK iGEM 2015

Bringing so many people together for the purpose of synthetic biology is challenging. Anything fun and enjoyable on the other hand, is not. How do we put the fun into iGEM? Amongst wiki scripts, lab protocols and keeping an eye on deadlines, a bonding element must arise to keep together a team that might otherwise fall apart. When some aspects of iGEM can start to feel isolating in any way, doing fun things as a team can seal the sense of togetherness that boosts productivity and could go as far as to determine the overall success of the team in this year's project, as well as in the future.

Food and Wine

Having meals together, going out for drinks and the occasional pool showdown with very occasional expletives and thoroughly constructive spirit of competition are the bread and butter of socialising for Birkbeck iGEM 2015.

Florence and the Genetically Engineered Machine

Our team mascot has given us far too many opportunitties for fun. Whether it's having a pipetting assistant, playing quick rugby with Eddie coli, or

setting up roleplays between the two, the possibilites are endless when it comes to microorganism plushy toys. With creativity being a huge part of iGEM, whether in the lab or on paper, playing these games is as much fun as it is stimulating to the brain!

Just about Anything Else

If you don't find an excuse to get silly and do something funny, make one! Any situation can be made fun with a bit of imagination. Lab gloves make the perfect angry birds or balloons, while summer is the time to take a sunbathing break!

iGEM London Boot Camp and School Science Busking

Additional team activities in iGEM collaboration and community involvement

iGEM London Boot Camp

This June University College London, Birkbeck and London Biohackspace attended a jointly organised iGEM boot camp featuring BioBrick making in the lab, presentations from key iGEM team advisors as well as Skype talks with iGEM Headquarters representatives, DIY spectrophotometers, wiki design and extra lab skills.

The purpose of this successful week-long event was to kickstart all team projects and bring all members to the same page in our iGEM journey. The knowledge and experience acquired by everyone enabled the individual teams to start making the most of their summer work which is now underway. All participants benefited from laboratory induction sessions, and smaller groups divided into specialised tracks.

The DIY track group assembled a functional spectrophotometer at the London Biohackspace using 3D printed components, while the Software track group learnt the basic progrsmming required in developing the iGEM wiki and submitting BioBricks to the registry. Finally, the extra lab group received insights into the most efficient cutting edge cloning technologies relevant to iGEM work.

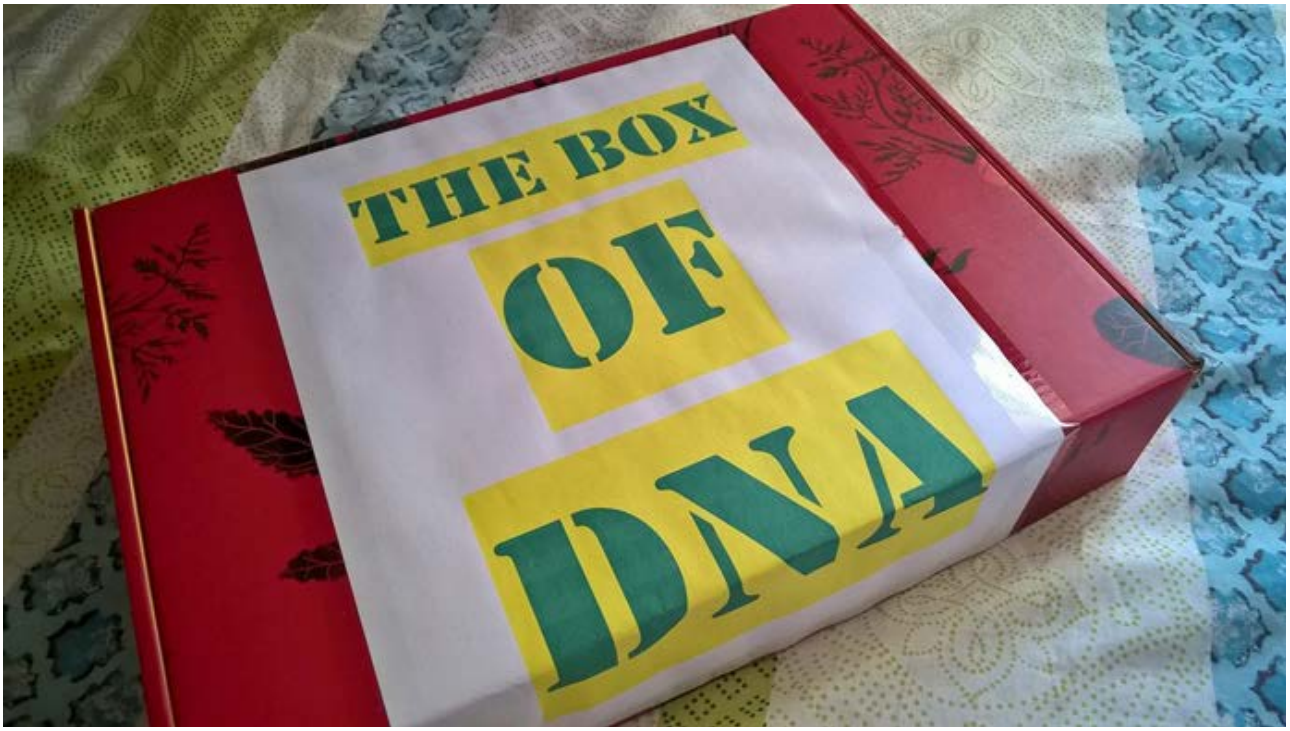
The boot camp culminated in the Mini Jamboree where all different institution teams presented their work over the past week to the rest of the attendants including highschoolers, and the track groups also presented their specific projects. The networking opportunities throughout the boot camp strengthened our teams, and wrapped up with a fantatic snacks and drinks sleection after the jamboree!

School Science Busking

As the Birkbeck iGEM 2015 team, we found it essential to involve the wider community in the ideas underpinning iGEM, more broadly about synthetic biology and genetic information. Since most primary schools in the UK do not have a teacher specifically trained in the sciences, we took the oportunity of a science busking at a William Tyndale Primary School in Islington. Our aim was to use fun props and games to illustrate key concepts in genetics to an eager audience of four separate classes of 9-year olds and 11-year olds.

The planning necessary before the big day was instrumental in our success. We devised scripts to involve all out team in the presentations and games while leaving room for inevitable improvisation, designed engaging and practically feasible games with a tight time limit, crafted attractive props and finally rehearsed numerous times to ensure our busk was going to be memorable.

We came up with four different games. The first one involved a talk about germs and a game where clapping children would react to glitter on their hands when a team member in our clapping row introduced it at a random time. The glitter symbolised germs, and the game showed the children unequivocally just how easily they spread through brief hand to hand contact. Our second game elegantly illustrated the notions in Mendelian genetics by using red and white beans as alleles for flower colour. The kids were given varying combinations of these beans and had to work out what colour they produced.



Cautiously, we introduced DNA as a concept to the children in our third and fourth games. We assigned volunteers a nucleotide base and through complementary binding and strand annealing we created a human DNA. Finally, paper DNA with action codes on was given to groups of pupils. After decoding their piece of DNA, the whole class acted out what it specified all at once as the DNA was "activated".

The reactions from the most enthusiastic children were unforgettable and hilarious in equal measure, and we can safely say that even the most sceptical of kids became fascinated by the end of our busk.

Comp etition

About Competition system. By TecCEM & TecCEM_HS

About Competition System

What do you think of the competition system this year?

Being the first time the team members get to experience iGEM, we feel the competition system has been friendly, and it has been made easy to work and comply with its requirements. However, given the nature and objectives of our project, the standardized forms and requirements may not entirely apply to our protocols and results which have made a bit difficult to follow up without contacting iGEM HQ for further guidance. We hope that our project and experiences help further research and iGEM teams who are interested in these novel techniques. Almost half way through, it has been an amazing experience from which we have learnt a lot, and we hope to keep making the most out of this opportunity!

What is the impact of your team?

Our team does not only intend to contribute to science and research by developing our DNA nanomolecules proposal, but we are also interested in keep spreading the word out about synthetic biology and the advantages it poses. We have designed and taught a three-sessions course within our Uni grounds regarding synthetic and systems biology with both the help of ITESM CEM and other University lecturers. Finally, should the objectives of our iGEM project be fulfilled, we could further develop the proposal in order to impact remediation strategies at both laboratory and industry scales. We are excited about this idea, and we will work to the best of our abilities to impact science, industry, and society as much as possible.

Team: TecCEM

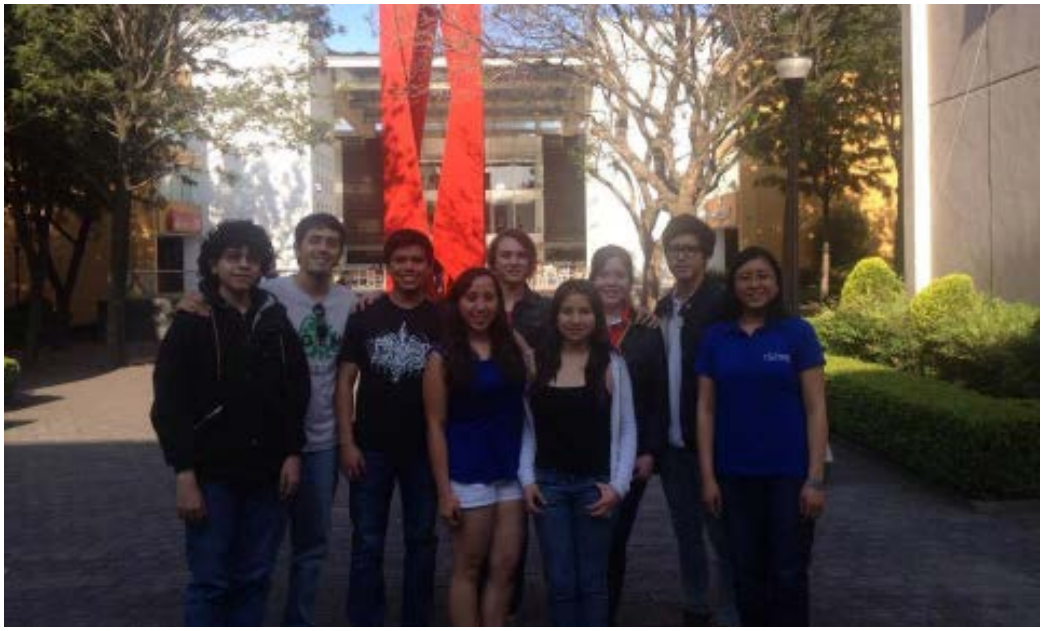
What do you think of the competition system this year?

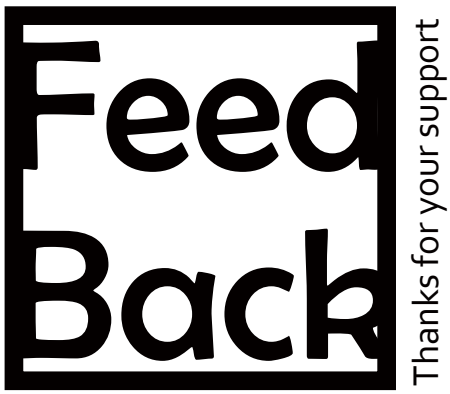
We absolutely love the fact that we are going to compete against other high school teams but at the same time we will be able to experience a Giant Jamboree and meet other undergrad teams and see how they apply their knowledge in developing extraordinary projects! We all agree that high school teams should be judged differently because we may not have all the knowledge or tools as undergrad or overgrad teams, so we are glad that the judging criteria is not so tough for us.
We are excited to be there and share everything we learned and our projects with teams from all over the world!

What is the impact of your team?

Being a team of students that are so young and eager to learn and understand how science can do such amazing things and give us the necessary tools to apply everything we have been learning, we believe that we can have an impact in younger students and let them know about synthetic biology even at ages under 10, we want high school or elementary school students to understand what all this is about and hopefully, to encourage them into entering this competition in a near future, so we can create a larger network. Also, we are trying to tell the people that live near the laka about our project and explain to them how synthetic biology could help us solve such problems. Creating this team, we add one more to the short list of Mexican teams that will participate, and we hope that list gets bigger each year !

Team: TecCEM_HS





Thanks for your support

Feedback

1.Is this issue useful for your team?
A. Yes. It may help.
B. No. I cannot see any important reference value to my own team, because each situation differs.
C. Maybe a little.

2. How many passages are suitable for each issue?
A. Not more than 5.
B. 6-8
C. 9-12
D.13-15
E.15-20

3. How often should we publish Newsletter?
A. Weekly.
B. Biweekly. (The same as last year)
C. Triweekly.
D. Monthly.

4. Is is necessary to add new content besides project & update?
A. Yes. (Run to 5)
B. No (Run to 6)

5. What contents can be added in Newsletter (multiple-choice) ?
A. Discussion on bioethics.
B. Experts' interviews.
C. Summary information for Biobricks.
D. Wiki technology.
E. Art & Design.
F. Others _____(Please let us know your idea)

6. Are there any problems you have encountered? Would you like to write them down on Newsletter so that other readers can help you?

7. Any suggestions after reading this issue? Help us to make the Newsletter better!

Thank you for your support.
Please complete the feedback form and send it to us: igemxmu@gmail.com