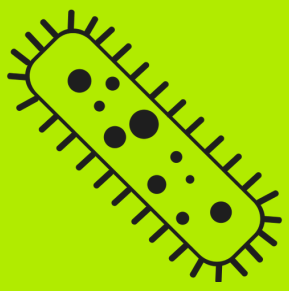
IGEM LATINOAMÉRICA

First iGEM Latin American



KNOW THE SYNTHETIC BIOLOGY AND IGEM

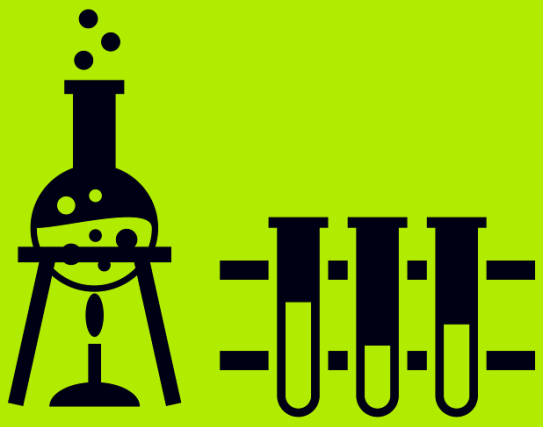
We invite you to know the Synthetic Biology and the most important international competition of this discipline.

LATIN AMERICAN TEAMS IN IGEM 2017

10 teams from Latin America will present their projects at the GIant Jamboree in November of this year. Learn about their innovative projects and ideas.

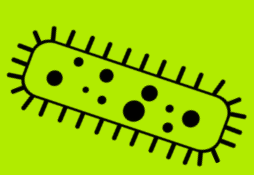
CONTENT

iGEM Latin America aims to disseminate the projects that different teams from Latin American countries are developing to present in the international synthetic biology competition iGEM and to inform how they can contribute in a beneficial way to society. This is a non-profit journal with purely informative purposes, of students for the world. After the Giant Jamboree we will relaunch this magazine.



Synthetic Biology

Synthetic Biology is defined as the construction of biological systems with new functions that are not found in nature. It is a discipline that, unlike biology, is not based on the study of living beings, but rather aims to design new tools based on biological mechanisms. For example, a common application is the modification of bacteria to produce a product of interest or the detection of a toxic compound.



iGEM

iGEM stands for International Genetically Engineered Machine, which translates into Spanish as a Genetically Engineered Machine. It corresponds to an international event where various secondary and university teams and some laboratories around the world present their innovative ideas and projects using genetic tools under the concept of synthetic biology. The year 2003 began as an independent activity of students of the Massachusetts Institute of Techonology (MIT) that over the years was growing involving teams from different regions of the world. This year, 10 teams from different countries of Latin America (Mexico, Peru, Brazil and Chile) will participate in this great event.

CITRIC OFF

iGEM TEC_CEM - México

Huanglongbing disease (HLB) is an important bacterial disease present in citrus plants around the world. It is transmitted through *Diaphorina citri*, a type of psyllid. The difficulty in cultivating bacteria, their rapid spread and the devastating effects, have made HLB one of the most important pests in the world. Current methods of HLB control include insecticides and antibiotics that present short-term solutions, which are not specific and can cause a negative impact on the plants and the final product. Team TEC CEM designed a genetic machinery with interfering RNAs (siRNAs) targeting four different D. citri genes to prevent infection and the spread of HLB.

Group History

Three years ago, a group of biotechnology students from our university campus (Tecnológico de Monterrey) decided to start the iGEM tradition. Since then, every year students of all races are invited to join the IGEM TEC CEM team. This year we are 12 biotechnology students who work together to face one of the biggest problems of Huanglongbing disease in the Mexican countryside. We started as 13 members, but one of them rejected the opportunity due to lack of time.

Human Practices

As our work on social practices went to primary schools to teach children about synthetic biology and arouse their interest in science and our project. We made a visit to the INIFAP National Institute of Forestry, Agriculture and Livestock Research to interview experts on the subject. We made a laboratory manual for elementary school children in collaboration with other Mexican teams. We visited the regional laboratory of massive reproduction of Tamarixia Radiata to learn more about the management of the Asian citrus psyllid Diaphorina citri for its study and manipulation.

Difficulties

We did not have much financial support from our University. During the summer, our laboratory was closed because the university authorities decided that the building was going to be painted and cleaned. So we had to move our experiments and the whole project to an interim laboratory and we also had to work in the facilities of CINVESTAV to be able to do the work that we needed. Later, in September, when we were able to work in our laboratory, a terrible earthquake shook the city of Mexico and its surroundings leaving the city paralyzed and our university was closed for a week and a half.

BiMaToX

Team UChile_Biotec - Chile

BiMaTox is a biosensor of marine toxins that occur during the blooms of harmful algae, a phenomenon known as red tide. Of these toxins, saxitoxin is the most lethal since it attacks the human nervous system preventing the formation of synapses. The biosensor consists of a cell-free cellulose matrix device that shows a color in the presence of the toxin. This color is produced by "aptazymes" that are contained within the device. The aptazyme consists of a DNA sequence with an element that detects the toxin (aptamer) and an element that has catalytic activity (DNAzyme), generating the oxidation of a compound called ABTS, which produces a detectable color for the human eye. The device is ergonomic and will eventually allow fishermen to know when there are toxins in their fishing area.

Group History

The history of our team starts as a group of friends who organized to hold a biotechnology symposium in 2016. At the end of the same year, they decided to participate in a synthetic biology course created by managing the most experienced students in the group and our teacher guide Francisco Chávez. As final work of this course, several projects with potential to develop in iGEM were presented, among them, a red tide biosensor that would be carved and improved to become the official project of the UChile_Biotec Team. The team currently has 13 members, mostly biotechnology students and an industrial designer. On the way, 3 members have left for personal reasons.

Human Practices

To understand the real social and economic importance of our device, as well as its design, our team spent a good amount of time getting to know the people affected by the red tide last year, through interviews and visits to Chiloé and Puerto Montt. , in the 10th Region of our country, affected area last year. We consulted fishermen, trade unions, mayors, foundations, laboratories, companies and national detection agencies, who gave us their support and personal opinions on our proposal, generating a global and integrated vision of our solution. In addition, we collaborate with the community through scientific fairs, forums on the red tide in schools, workshops, creation of a synthetic biology course at our university, among others (related to public participation).

Difficulties

The main problem with which we have had to charge are the high figures of money that we must pay in plane tickets, group and individual registrations and stay. At the same time, we have had great difficulties in finding auspices and financing because the economic reality of science in our country is rather insufficient. Another great difficulty has been to take the project forward even though we are in class periods. The teams of countries in the northern cone of the world develop their iGEM projects during the holiday period, so they can dedicate themselves entirely to them.

Greenhardtii Proyect

Chile OpenBio_CeBiB

During 2015, the global average of atmospheric CO_2 concentration exceeded the 400 ppm threshold and will continue to increase. But can you think of CO_2 as an exploitable resource? Greenhardtii Project is an initiative that seeks to generate a green microalga with an optimized carbon absorption capacity, using this as a cellular fuel to use it as a platform for the production of desired biomolecules. The optimization of the Calvin cycle in our Greenhardtii platform (Green + Chlamydomonas reinhardtii) is produced by the expression of a cyanobacterial enzyme. In addition, the test of the kinetic behavior of an adjustable promoter and the inhibition of the pathways will be performed in a mathematical model. For Greenhardtii Project, linking science with society is essential, so the design of a photobioreactor is being developed to propose installations in one of the sectors with the worst air standards in Chile.

Group History

OpenBio began 2013 at the University of Chile, with the mission and vision of teaching and explaining synthetic biology in each activity carried out. Then, for the first time, in 2015, our group attends the Igem Jamboree and set out to be there every 2 years. Our team started in 2016 with the call of biotechnologists, engineers, designers and social workers to find and define a project, which resulted in the Greenhardtii Project.

Human Practices

The community of Los Maitenes has lived for more than 20 years under the worst air quality in Chile. The settlers, since the thermoelectric plants were established, have been losing their crops and animals. That is why we believe that Los Maitenes should be the beginning of the Greenhardtii Revolution. Starting with the cultural design of a bioreactor for microalgae and then analyzing the needs of the community to synthesize imported biomaterials (in this case biofertilizers). In addition, we have been researching other biomaterials at the university's facilities and being present at scientific fairs open to the community.

Difficulties

The greatest difficulty of going to iGEM is receiving support, be it economic or institutional. The ignorance of science and its potential, produces that municipalities or companies are not sure to support initiatives that are emerging. On the other hand, the remoteness of Chile and the cessation of services on weekends or holidays have hurt us due to delays and excessive costs.

PHAgave

IGEM TEC TEAM GDA

PHAgave aims to synthesize polyhydroxyalkanoates (PHA), a form of bioplastic produced naturally by bacterial fermentation, from the carbon sources available in the residues of the tequila production process through a recombinant strain of E. coli. The study compares the metabolic rate for the synthesis of PHA between Pseudomonas putida KT2440 and a recombinant E. coli with the genes for the synthesis of PHA (ACC, fabG, phaG, phaC1 and phaC2) for continuous production of the bioplastic.

Group History

In 2016, a group of science students was invited to attend the UN Biodiversity Conference in Cancun, Mexico. The group witnessed the lack of participation of the scientific community and young people in the regulatory processes. The creation of a community focused on communication and the development of science was proposed. Youth Biotech, an international association that focuses on communication, regulation and development of science, was born. In the path of the development of science, we founded the PHAgave project.

Human Practices

In collaboration with the Chihuahua and CDMX teams, we created a fun science experiment manual for primary school students in which we seek to involve children with science. We made two visits to Tequileras, Camarena and Tequileño, to validate our project. As part of Youth Biotech, we participate in communication and science regulation events: ISBGMO, AMEXBIO risk analysis course, participation in TecnoX, SynBio Live event, All Biotech and Gap Summit.

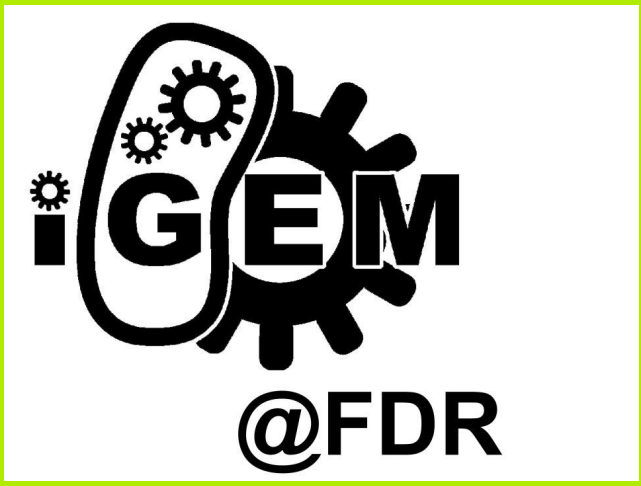
Difficulties

Initially, we thought about the diaper degradation problem as a project, but we soon realized the biosecurity problems. The other problem was money. We need to look for sponsors but it was difficult for us to find someone interested in supporting scientific research. Our school was interested in supporting us and paid for the participation of the team. We had another problem with the kit, it did not arrive on time and with the order of the constructs, because they did not arrive.

Featherase

iGEM ColegioFDR_Peru

One of the most persistent and complicated problems in poultry farming is the elimination of feather waste. Chicken feathers are composed mainly of keratin, a strong and fibrous protein that can not be degraded with proteins such as bromelain, pepsin or papain. The lack of elimination of these feathers can cause health and environmental problems related to the transmission of diseases such as bird flu (H5N1), a disease that can kill chicken populations, and also has the potential to cause devastating effects on Humans. , having killed approximately 60% of all humans who have suffered the disease since 1997. Our project works to develop a safe and environmentally friendly solution for this problem that involves the implementation of keratinase kerA and kerBPN in DH5-Alpha E. coli through the transformation and assemble a prototype that allows the degradation of keratin in the aforementioned feathers.



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Human Practices

The team had many difficulties throughout the project. In the first place, the main companies in Peru had already provided a feasible solution in terms of the use of feather waste. Therefore, a large part of the problem of the poultry industry was solved. However, there are still many smaller farms that have treated feather waste inefficiently. The problem we found here was the time it took us to realize the real problem. Also, since we are a high school team, we had to focus on the public participation section. Although we tried several methods, based on our participation in this project, we could not assure any knowledge of the importance of synthetic biology raised here in Peru.

Difficulties

The greatest difficulty was the lack of knowledge support. Although the members tried to investigate the details, they found it difficult to understand the concepts shown in the research papers. However, we tried to establish an official connection with a local university, since they still did not have a biology department, not only lack of knowledge but also lack of equipment and specialized laboratories for the project. Another problem was customs. It took weeks for Peruvian customs to verify the article. And even after evaluating the articles, they would charge more than 1000 soles even if they were not items purchased in IDT. Finally, the economic aspect was a challenge. Without the support of the school, it was relatively difficult for the students to look for methods to collect donations for the cost of registration..

BlueBery

iGEM PASantiago

Our project is mainly aimed at radiologists and medical technologists, because they are constantly exposed to ionizing radiation, which is harmful to the body and accumulates over the years, causing skin problems to different types of cancer. Blueberi is a biological option for dosimeters that currently works to measure the amount of radiation to which the specialist was exposed. The problem with these devices is that the results can be affected by different external factors, as well as the adulterations when the results are sent to the National Health Service. This project consists of modifying a bacterium called Escherichia coli, through synthetic biology, which is based on the creation and modification of organisms that already exist, making them have the characteristics we want. These organisms will detect the high levels of alpha and beta particles, gamma and X-rays emitted, factors that cause a mutation in the DNA of the aforementioned bacteria, which will give a purple color and a lemon aroma.

Group Story

We started in 2015 to go to the scientific academy that practiced classes of genetic engineering, synthetic biology and instructed us with classes of scientific entrepreneurship in the Universidad Mayor -Seat Campus Huechuraba-. In mid-2016, we began to apply the knowledge in the laboratory and after this, we began to work in different groups of students from different schools in Puente Alto, groups that dealt with uneven topics in synthetic biology, where each group worked on their project , with the problems and needs to solve.

Human Practices

The team had a wide participation in scientific fairs to be able to bring synthetic biology to society. At the same time, they gave talks in different public and cultural spaces such as the Gabriela Mistral GAM cultural center and public schools in the city of Santiago. They also conducted interviews with those affected with this problem.

Erwinions

iGEM Tec-Chihuahua

Erwinia amylovora causes fire blight disease worldwide in some important crops such as apple, roses, pear and most Rosaceae's family members. For example, the largest Latin American apple producer has 3,000 hectare from which 50% are estimated to have the disease. This iGEM edition, Tec-Chihuahua presents its proposal to address this environmental/economical issue by using synthetic biology techniques to synthesize three enzymes that might inhibit most, if not all, of the virulence factors. The use of N-Acyl homoserine lactonase would directly affect the AHLs by hydrolyzing the main quorum sensing molecule. Then, the Cyclic-di-GMP phosphodiesterase would linearize the c-di-GMP avoiding the formation of biofilm while encouraging motility. Nevertheless, Tec-Chihuahua proposes to arrest flagellar rotation with a glycosyltransferase. As these are intracellular proteins, the pathogen should be genetically modified and tested hoping for a descent. Afterwards, the commercial and technical viability of a theoretical biocontrol would be developed as real proposal.

BioTrojan

iGEM USP-Brazil

Paratragénesis can be defined as a set of strategies to eliminate a pathogen from vector populations through the use of genetically modified symbionts, thus controlling vector-borne diseases. For our iGEM project, we have focused on generating a set of versatile molecular tools for the endogenous detection and elimination of pathogens transmitted by mosquitoes. We have selected Pantoea agglomerans, a ubiquitous bacteria that is enriched in the microbiota of the midgut of anophelines, as a novel chassis to attack malaria parasites. Two coupled genetic circuits (i) have been designed to detect biomarkers of malarial infection in the blood ingested by mosquitoes and (ii) for the subsequent production / secretion of synthetic anti-Plasmodium peptides. A third module, consisting of an endogenous bacterial killer switch, was designed to control the population dynamics of the genetically modified symbiont. This is the first study that combines the conceptual frameworks of paratragénesis and synthetic biology, with great potential for the generation of novel approaches to combat mosquito-borne diseases.

Insubiota

iGEM AQA_Unesp

Our project was inspired by the alarming and growing number of people with diabetes, especially patients with diabetes mellitus type 1, who are dependent on insulin. The lack of less invasive treatments has motivated us to develop a new treatment based on the probiotic bacteria Lactococcus lactis, which was designed to produce a single chain analog insulin in the microbiota of human diabetes. The bacteria may produce the insulin associated with a signal sequence of secretion and peptides that penetrate the cell, to ensure its uptake. In addition, the synthesis of insulin will be controlled by the system of natural bacteria of repression of catabolites regulated by an RNA. In the presence of glucose, the expression of the insulin gene will be activated and then ready to be secreted and absorbed, reaching the blood and performing its biological function. The final product could be a fermented or lyophilized milk that patients could easily ingest.

CRISPeasy

iGEM Amazonas_Brazil

The basic component of synthetic biology is to facilitate the engineering of biological systems. Standardization is a fundamental key to that goal. The CRISPR / Cas9 machinery paves the way to accurately edit living cell genomes. Although revolutionary, the SynBio community has an obstacle: the CRISPR / Cas9 protocol is superficially standardized and requires a considerable amount of wet laboratory work due to the multiple plasmid system. Our goal is to build a one-step genomic engineering toolbox based on a standard BioBrick vector. To go further, we unify human practice with pattern recognition and machine learning to overcome the limits in the path of SynBio's advancement. We also bring the concept of computational repository for laboratory "algorithms", the protocols, developing an open and integrated platform to expand the iGEM experience. Our perspective is to leave a legacy and provide a bacterial genome editing machinery based on the easy to design BioBrick parts assembly as A-B-C ... CRISPR

Acknowledgment

This magazine has purely informative purposes and has been achieved thanks to the collaboration of all the Latin American teams that participate in the edition of iGEM 2017, we greatly appreciate your contribution.

After the competition we hope to make a remake of this magazine completing the missing information of some teams. We hope that this magazine has continuity with the years and that iGEM Latinoamérica can one day be a huge interdisciplinary network of collaboration between the Latin American teams that participate every year in iGEM.

Team UChile_Biotec