Successful iGEM teams sponsored by SYNENERGENE

By Zoë Robaey[i]

On October 27-31 the international Genetic Engineering Machine competition (iGEM) welcomed 3,000 attendees to Boston for the Giant Jamboree, the annual gathering of students presenting their projects. We congratulate the eight SYNENERGENE sponsored iGEM teams who presented their fantastic work. It was an honour for us to work with them.

Wageningen UR iGEM team

The most important cause for increased bee mortality is the parasitic mite *Varroa destructor*. Beekeepers and bee researchers stress that the first and most important step to save the bees should be to control *Varroa* more effectively. iGEM Wageningen UR 2016 aimed to save the bees from *Varroa* through Bee T: Engineered bacteria that releases toxin in a specified and regulated manner. The released toxin is not harmful to bees or humans. he released toxin is not harmful to bees or humans. The toxin is only produced when mites are present and when enough bacteria are present to effectively kill the mite. Bee T is also intended to strictly confine the bacteria to the treated hive, preventing them from spreading and mixing with natural ecosystems.

Gold Medal, Nominated for Best Food & Nutrition, Nominated for Best Wiki, Nominated for Best Poster, Nominated for Best Integrated Human Practices, Nominated for Best Model, Nominated for Best Applied Design, Finalist, First Runner up Overgrad

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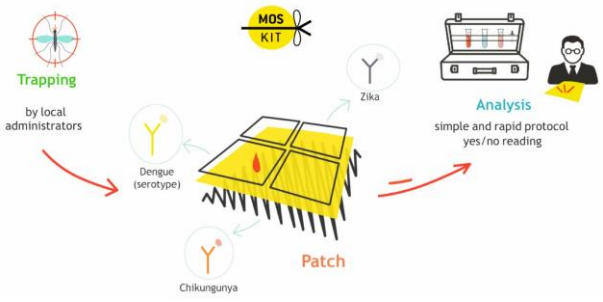
iGEM Pasteur

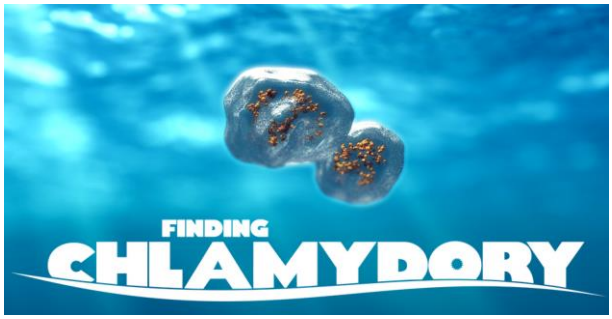


The development of a better mapping tool of vector-borne diseases to specifically target insecticide spreading in infected areas only, to facilitate rapid diagnosis, and significantly improve the prevention of these diseases before outbreak appearance. To do that, the team engineered a kit named MOS(KIT)O, containing:

- A trap to capture mosquitoes
- A diagnostic patch for detection of the presence or absence of virus in these vectors.

Gold Medal, Nominated for best presentation, 3 Awards for best Entrepreuneurship, best Applied Design, Best Diagnostics in Overgrad

iGEM Hamburg



Chlamydia trachomatis is a bacterial pathogen, which causes infertility in women and permanent blindness if untreated. Yearly, this leads to blindness of 1.2 Million people affected, primarily in developing countries.

The team developed E. coli containing a Chlamydia specific biosensor linked with a Green Fluorescent Protein activator. The bacteria were immobilized in a microfluidic chip, ensuring a safe, contamination free and defined environment, into which the patient samples would be injected for the diagnosis. To detect the fluorescent signals, the diagnostic microfluidic device can then be loaded onto a Lab-in-phone-device, specifically developed for a model used by the team's cooperation partners in the Blantyre Institute for Community Ophtamology (BICO) in Malawi.

Silver Medal

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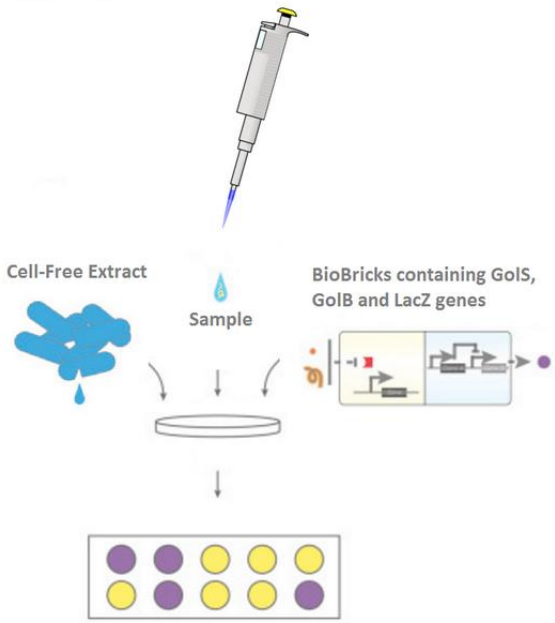
iGEM Marburg

Implementing a novel 'plug-and-play' production platform based on artificial endosymbiosis for bioproducts, especially biofuels and high value chemicals, to give rise to a realistic alternative to fossil fuels and biofuel production. By implementing and splitting a biosynthesis pathway into two organisms, the heavy load of metabolic burden is shared, resulting in higher production yields and growth rates.

Saccharomyces cerevisiae, the host, produces a metabolite which *E.coli*, the endosymbiont, is able to metabolize further into the desired product. By switching endosymbionts, equipped with different biosynthesis pathways, different endproducts can be achieved. This makes a versatile and modular system, which can be applied to numerous production pathways. By adding a photosynthetically active cyanobacterium to the system sugars can be produced from CO2, water and sunlight, thus avoiding the use of arable land (and land grabbing).

Silver Medal

iGEM Toronto



An environmentally-friendly cell-free paper-based synthetic biological sensor for detecting gold for the mining industry.

By creating biosensors, the team intended to develop a quick, easy and affordable method for detection of gold in soil samples. The team used a transcriptional activator, GolS, and its variants, which induce their associated reporter genes in the presence of gold ions. These reporter genes were selected to act as visual indicators. The computational team augmented this project by engineering a smartphone application for colorimetric analysis. This was done using the smartphone's camera input of the visual indicators to estimate the amount of gold present in a sample. The computational also developed a pipeline to identify gene clusters related to a given function of interest.

Bronze Medal

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iGEM UC Davis

iGEM UC Davis explored a new alternative to produce food pigmentation through proteins from cyanobacteria, focusing on blue colours which are extremely difficult to replicate in beverages and food. The team approached this project by thinking about four large technical considerations: protein discovery, novel GAF protein expression, production optimization, and expression in GRAS organism. However, the technical work is only a small part in the larger aim of our project to bring together science, industry regulation, and consumer acceptance.

Gold Medal

iGEM Purdue Biomakers

Water phosphate concentrations greater than 25 µg/L are known to drive the growth of harmful algal blooms, which compromise water quality and cost global industry more than ten billion USD in damage annually. By inserting transformed genes putatively responsible for inorganic phosphate transport and polyphosphate synthesis from *Microlunatus phosphovorus*, a phosphorus-accumulating organism (PAO), into *E. coli* the phosphorus uptake of these microbial cells is increased. The team built a bioreactor and designed a suite of cost-effective phosphorus reclamation modules around xerogel-immobilized cells for contained, multipoint phosphate bioremediation.

Silver Medal

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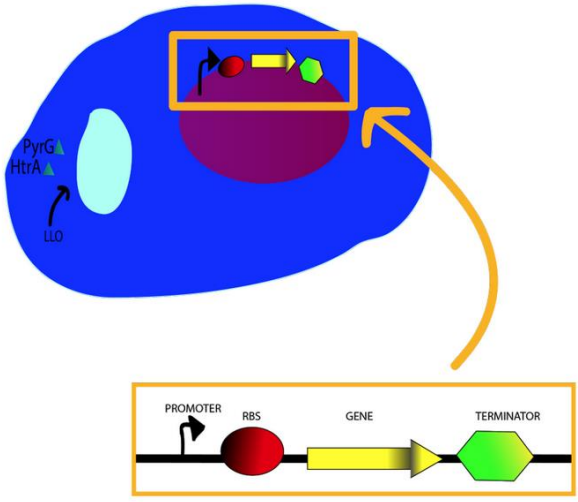
iGEM UCC Ireland



The team developed a synthetic *Lactococcus lactis*-based platform that can deliver proteins to immune cells to precisely influence the host immune response for use in the treatment of various diseases. Potential applications that were investigated include vaccination strategies and macrophage modification. The platform has been developed as a vaccine against leishmaniasis, a neglected tropical disease increasing in geographical distribution.

The inexpensive platform, through simple oral administration, has the capacity to deliver this protein to antigen-presenting cells, and potentially immunise against the life cycle of leishmaniasis. Besides vaccination strategies, this platform may be employed to modify the phenotype of other phagocytic cells associated with diseases such as cancer.
Gold Medal

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[i] *Zoë Robaey joined the Rathenau Institute (NL) in June 2016. Her work focuses on issues of responsible research and innovation in modern biotechnology. One of the main projects she is involved with is SYNENERGENE*