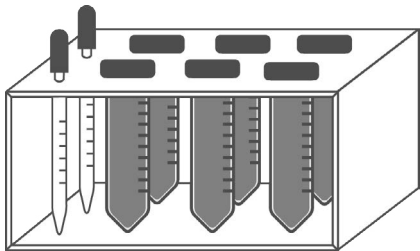


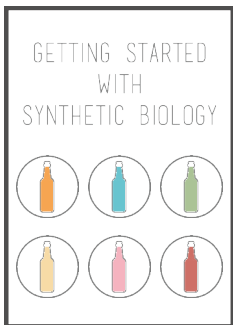
# GETTING STARTED WITH SYNTHETIC BIOLOGY



## WHAT WE PROVIDE:

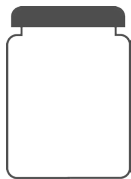


- 2 GLASS PIPETTES
- 6X10G YEAST TUBES
- PIPETTE HOLDER

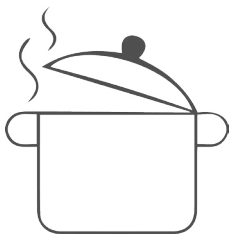


MANUAL

## WHAT YOU'LL NEED:



DEXTROSE  
MALT  
EXTRACT



BOILED  
WATER  
H<sub>2</sub>O



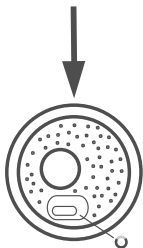
BEER  
BREWING  
KIT

# BEFORE GETTING STARTED LET'S UNDERSTAND THE SCIENCE!



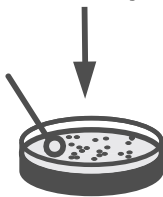
## Designing the plasmid

In order to make an yeast perform tasks you want, we have to insert the DNA which codes for the protein with the desired effect into the yeast. The selected part of sequence can be inserted into a loop of DNA called a plasmid.



## Transformation

During transformation, the plasmid we created is inserted into the yeast nucleus. The yeast reads the inserted DNA and starts producing proteins based on the information in our plasmid.



## Grow yeast on plate

Once the yeast has been transformed, we grow the yeast on an agar plate, which provides the yeast with necessary nutrient to form colonies. These are then placed in an incubator and grown.



## Dry the yeast for product

Once the yeast is grown - we will freeze dry the yeast and send it to you. The product which has been delivered to you has been produced in our lab in a safe & awesome environment.



## oneProt2

Making  
drinking a  
bit more  
healthier

### Where do the genes come from?

This gene was invented by the Synbio Brewery team. It does not come from nature!

### What does this add to the beer?

The oneProt2 protein. (Made of Histidine, Isoleucine, Leucine, Lysine, Methionine, Phenylalanine, Threonine, Typtophan and Valine).

### What does it do?

Adds an extra dose of the essential amino acids (nutritionally important) = healthier beer



## Raspberry Pie

Like cider,  
but beer

### Where do the genes come from?

*Rubus idaeus* - the common raspberry

### What does this add to the beer?

Raspberry ketone

### What does it do?

Your beer will have distinctly raspberry overtones



## Super Fruity

Beer with  
an extra  
refreshing  
taste

### Where do the genes come from?

*Saccharomyces carlsbergensis* - Lager yeast

### What does this add to the beer?

This yeast makes all the fruity aroma compounds found in other beers, but more of them.

### What does it do?

Amplified the fruity aromas in the beer.



## Miracle Beer

Sweetness of miracle berry

### Where do the genes come from?

*Synsepalum dulcificum* - Miracle Berries

### What does this add to the beer?

Miraculin

### What does it do?

Miraculin is a natural sweetener and makes sour taste sweet. Enjoy the effect on your tastebuds.



## Vanilla Queen

Like cider, but beer

### Where do the genes come from?

Vanilla

### What does this add to the beer?

Vanillin

### What does it do?

Produces vanillin in the beer, which adds vanilla aroma to the beer.



## Tomato Red

Beer with an extra refreshing taste

### Where do the genes come from?

Tomatoes

### What does this add to the beer?

Lycopene

### What does it do?

Lycopene is a vibrant red pigment and an antioxidant - make your beer red and healthy all at once.

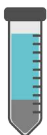
# PROTOCOL:



= 10G YEAST

## Pick an yeast strain!

Each sample contains 10g of yeast - Pick the strain you want and move on to the next step.



+2HRS

## Adding water to yeast

Boil water for 10-15 min and cool it down. Add the water directly into the falcon tube. Wait 2+ hours before next step.



48 - 72HRS

## Making DME

Make starter using dextrose malt extract (follow instruction on the DME you get). Drop the content of the falcon tube into the starter. Transfer the starter into a sanitized container. Seal the container with an airlock to prevent contamination. Wait for 48 - 72 hours.



READY TO GO

## Start brewing + Experiment!

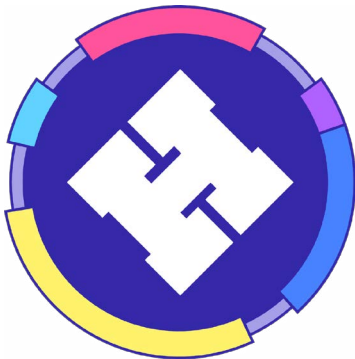
Your yeast is ready for brewing! Now add the yeast to your usual brewing process and brew along!:

- Make beer with 100% our beer
- Try out different combinations of our strains
- Mix it with other brewing strains

## WHO WE ARE:

London Biohackspace is a UK open biolab run entirely by its volunteer members based at the London Hackspace. We are the first community lab in the UK approved for working with genetically modified organisms.

Our lab is grounded on open-source principles and community development; London Biohackspace hopes to encourage enthusiastic amateurs and professionals with backgrounds in a broad mix of professions such as artists/engineers/biologists/programmers to carry out innovative bioscience projects.



## BACKGROUND OF THIS PRODUCT:

Our product, the DIY Brew Kit aims to provide anyone and everyone with an opportunity to get involved with synthetic biology. We encourage you to experiment with beer and expand your selection with our yeast strains.

The project also explores how effective such organisms are in producing genuinely novel drink products that can challenge our current perception of what beer is. We have produced an example product, a kit for home-brewers to experiment with different varieties of engineered yeast.

With rapid developments in the field of synthetic biology, we felt it would be beneficial to make a product which increases the public's awareness and understanding of synthetic biology. Through this project, we want you to discover the 'fun' in biology.

Our first step is to provide yeast strains to active home brewers and micro breweries where the infrastructure for using them already exists. We hope to expand our product range to include products aimed at those just starting out with home brewing.





## MORE ON SYN BIO:

Synthetic biology can be described as a field in which the principles of engineering are applied to biology, it focuses on designing and redesigning living systems. Often in ways that means systems perform functions or produce products they would not naturally produce, as we have done with the yeast in this kit.

Engineered biology is being used to help humans in all sorts of ways. For example engineered organisms are often used to produce medical compounds and compounds useful in numerous other industries. Biologists are also using the tools of synthetic biology to create micro-organisms which break down pollutants and clean up the environment, micro-organisms to be used as environmental and medical sensors, plants that produce better harvests, and many more inventions to improve our lives.

We hope that enjoying our SynBio Brewery genetically modified yeast strains has sparked your interest in synthetic biology. There are a huge number of resources available which explain synthetic biology in a little more detail, why not check out:

## OTHER PRODUCTS:

Advanced yeast kit (tools we could use to provide a platform to produce new yeast strains)

Rainbow Kit (Colour palette of beers)

Fruity Beer Kit

Glowing Beer

## CONTACT HELP:

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