

# The magic of synthetic biology



# Our stories:

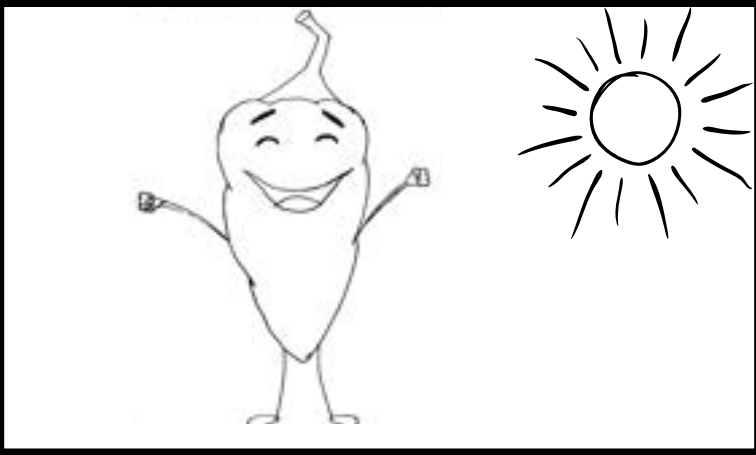
- iRNAldo and Chalino against the great oomycete (Tec-Chihuahua)
- The bombolitin (Thailand\_RIS)
- The Rust-Busters (UNSW iGEM2022)
- Binanox (Leiden)
- UBX protein (NYCU\_Formosa 2022)
- Antibody (CSMU Taiwan)
- Industries (REC CHENNAI)
- CADlock (Lambert\_GA)
- Nobesity (KCIS Xiugang Taipei)
- PCR (CityU Hong Kong)
- Fungus (CityU Hong Kong)
- Pichitecture (igem Vienna)
- Do you know? (GYHS)
- Paper based sensor (GYHS)
- How can I dispense the phosphate? (AACHEN)
- Endocrine disruptors (TECCEM)
- SPIDICIDE (UAM)
- Yeast resistant to radiation (Estonia\_TUIT)
- SELENOMELANIN (NCKU\_Tainan)
- Problems in the farm- CropFold (Aboa)
- Heparosanito (Biotech EC)
- AcidOceanus (UM\_MACAU)

The background of the slide is a sunburst pattern with rays emanating from the top-left corner, set against a teal background. The text is rendered in a bold, yellow, sans-serif font with a slight drop shadow.

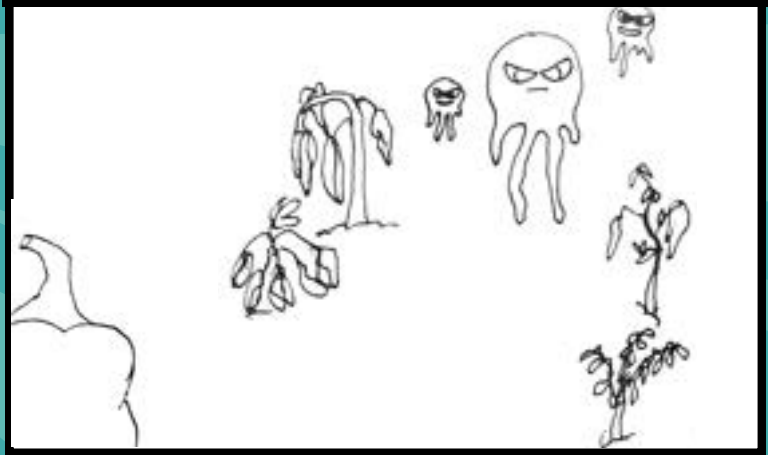
**iRNAldo and  
Chalino  
against the  
great  
oomycete**

**Tec-Chihuahua**

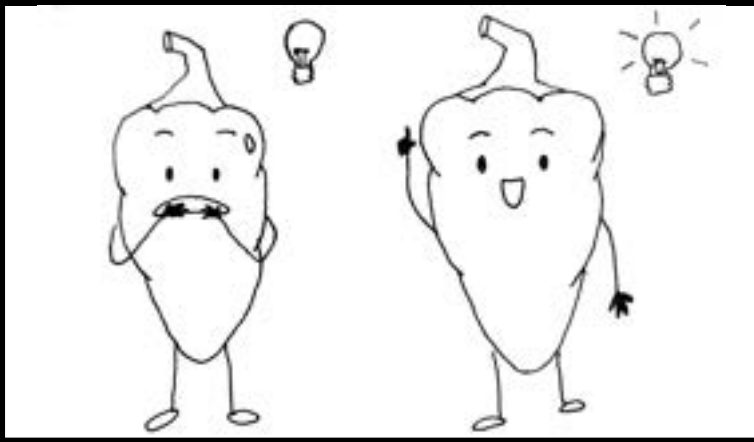
Once upon a time, there was a large/big jalapeño plant called Chalino. They spread their long leaves every morning to bask in the sun.



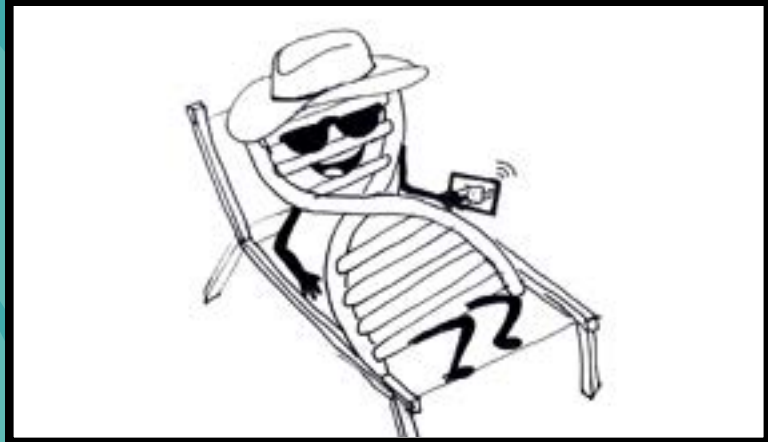
One morning, they were sunbathing and saw a large oomycete slowly approaching them while attacking the other plants.



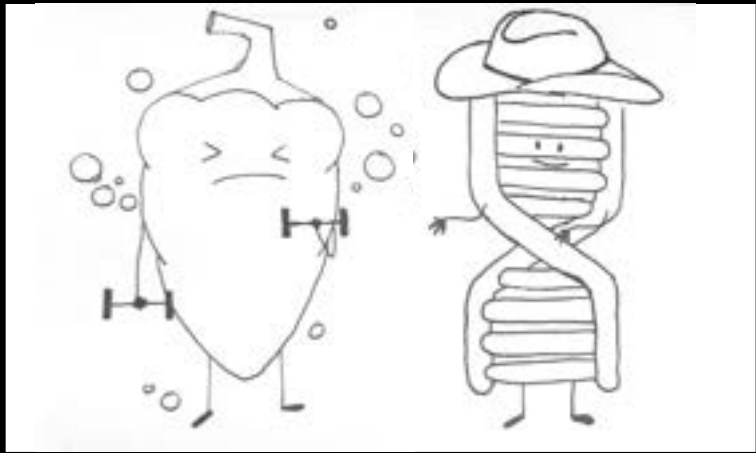
Terrified, but determined to defend themselves and stop the oomycete from harming other plants. Chalino called his old friend IRNaldo for help.



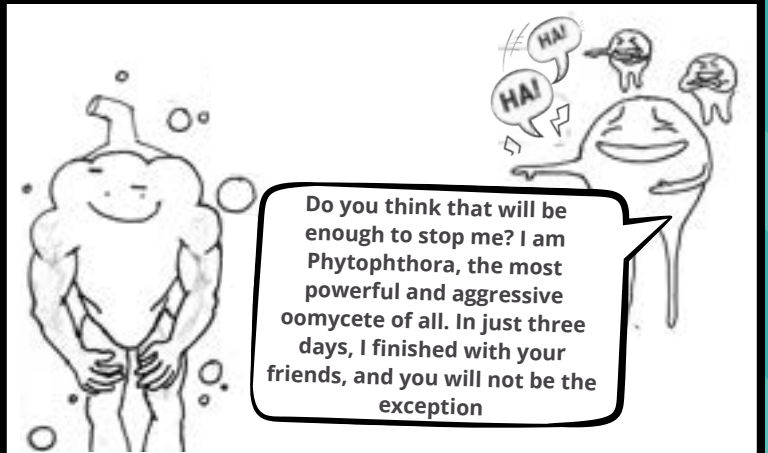
IRNaldo responded to their call and took with him his most powerful weapons: the peptides DsrB1 and PcosM.



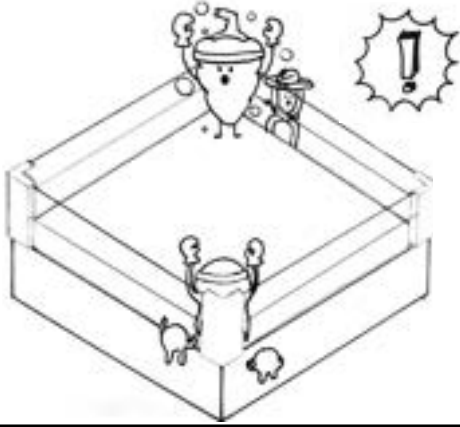
At the same time, Chalino prepared their defense system, and they both waited for the oomycete to arrive.



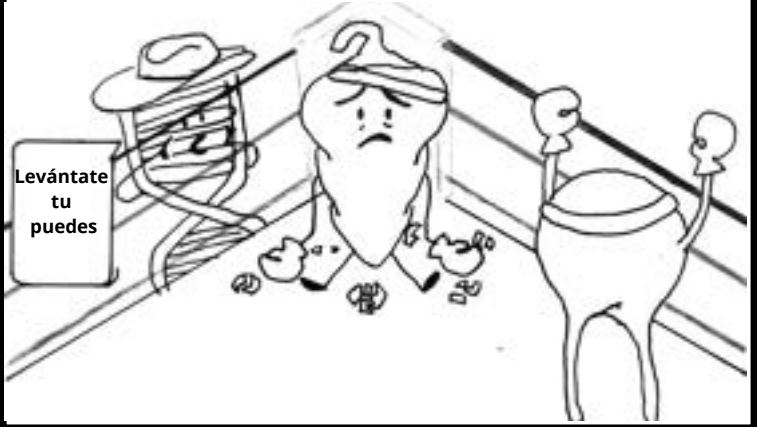
The oomycete came and taunted saying:



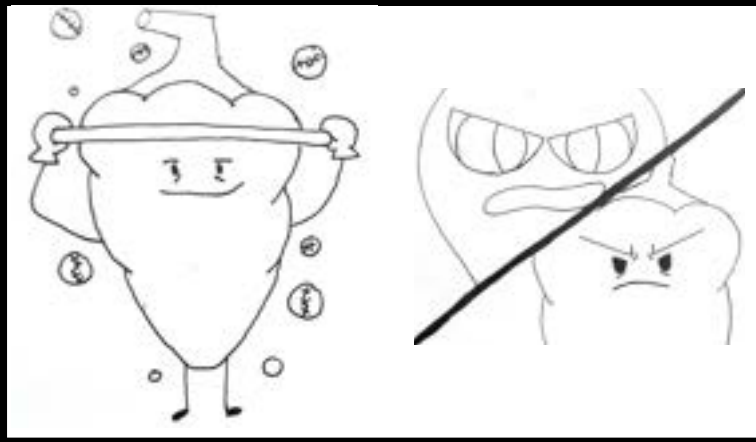
The great battle began



The oomycete began to release its effectors and absorb nutrients from Chalino. Chalino tried to resist with their defense system, but the effectors weakened them, and they fell.



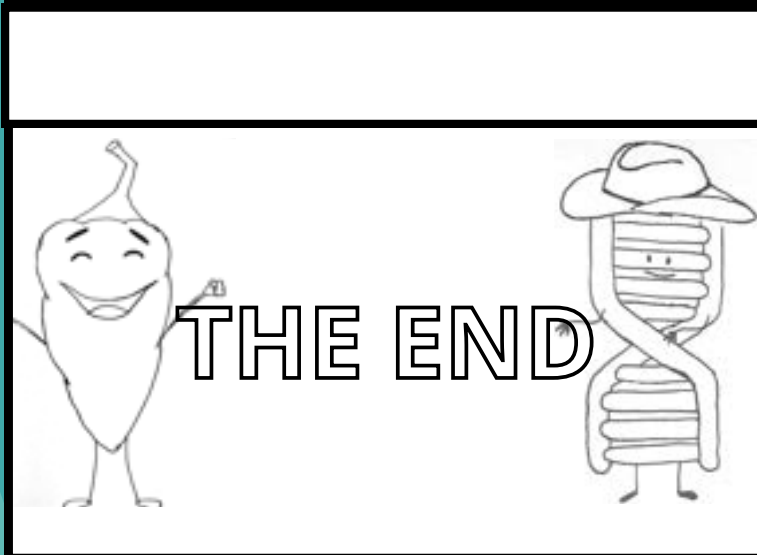
But IRNaldo deactivated the effectors and Chalino rejoined the fight. Simultaneously, IRNaldo released the peptides that weakened the oomycete's armor.



After an arduous fight, Chalino and IRNaldo managed to defeat the great oomycete.



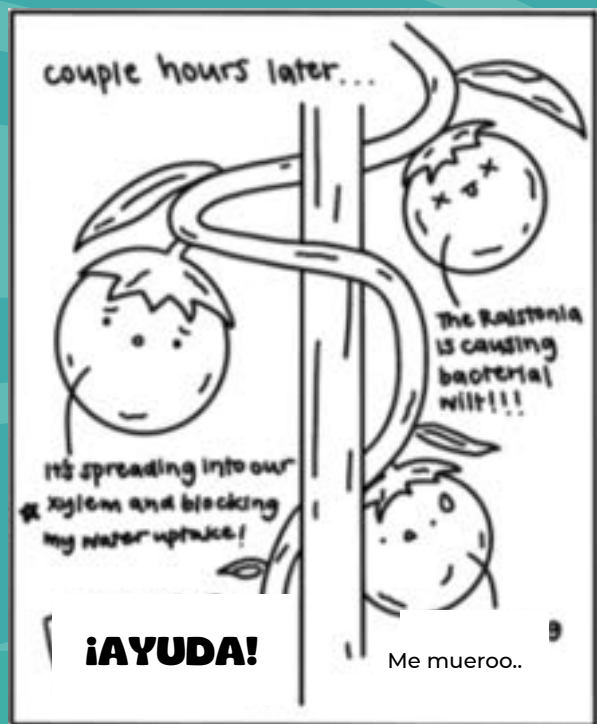
The other plants applauded the great bravery of Chalino and IRNaldo and they all lived peacefully.





**The  
bombolitin  
Thailand\_RIS**

# The BOMBOLITIN!



Pesticides will stop the Ralstonia infections



However, there are bad effects on the soil if we use pesticides!

The food is also unsafe to eat



**We have to find another way**

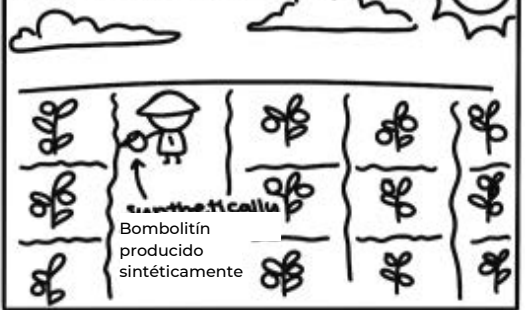
hmm... let me think



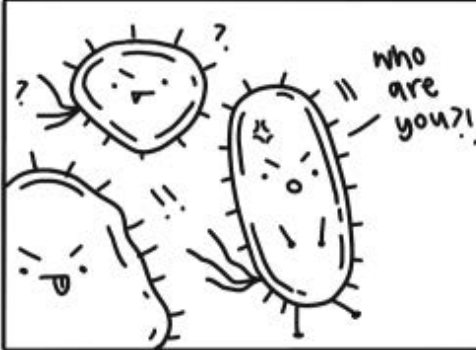
I GOT IT!!!



few moments later...



**in the tomatoes ...**

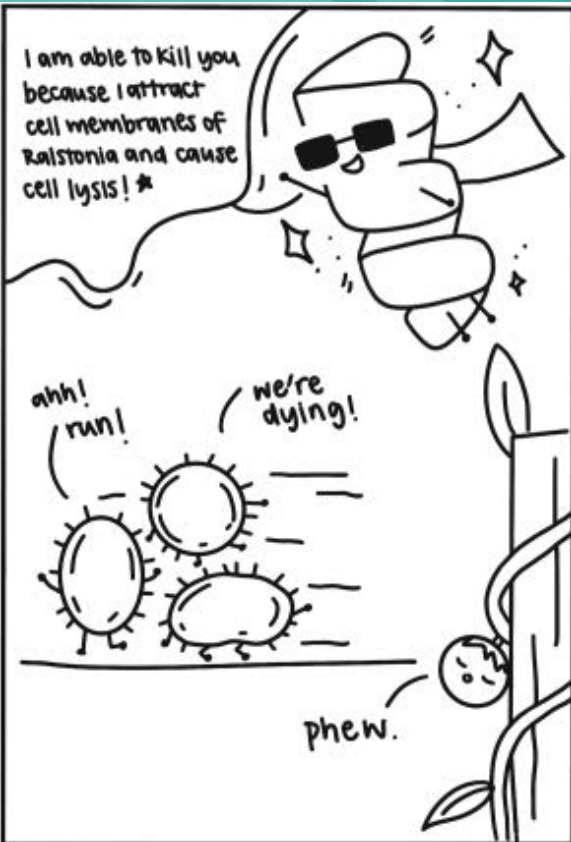


who are you?!



I am the synthetically produced **\*Bombolitin antimicrobial peptide**, and I am here to stop you!

I am able to kill you because I attract cell membranes of Ralstonia and cause cell lysis! \*

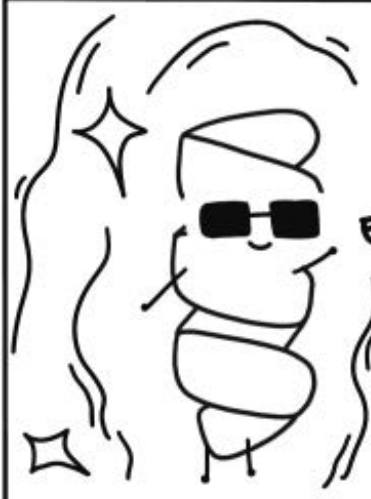


ahh! run!

we're dying!

phew.

I can be an alternative to pesticides as a solution to Ralstonia infections! **Everyone can be SAFER!**



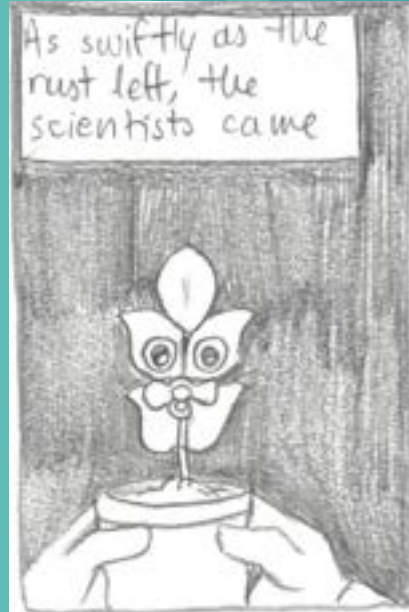
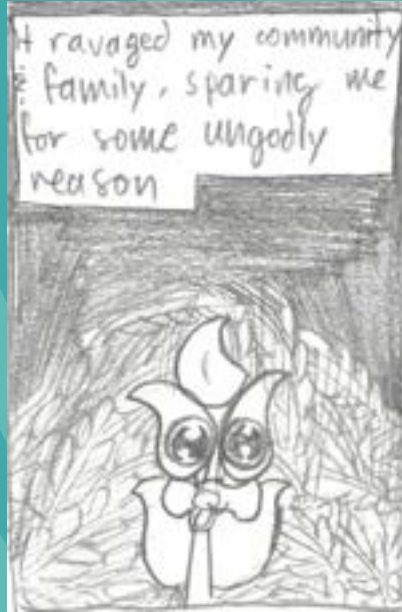
**Thank you Bombolitin!!!**

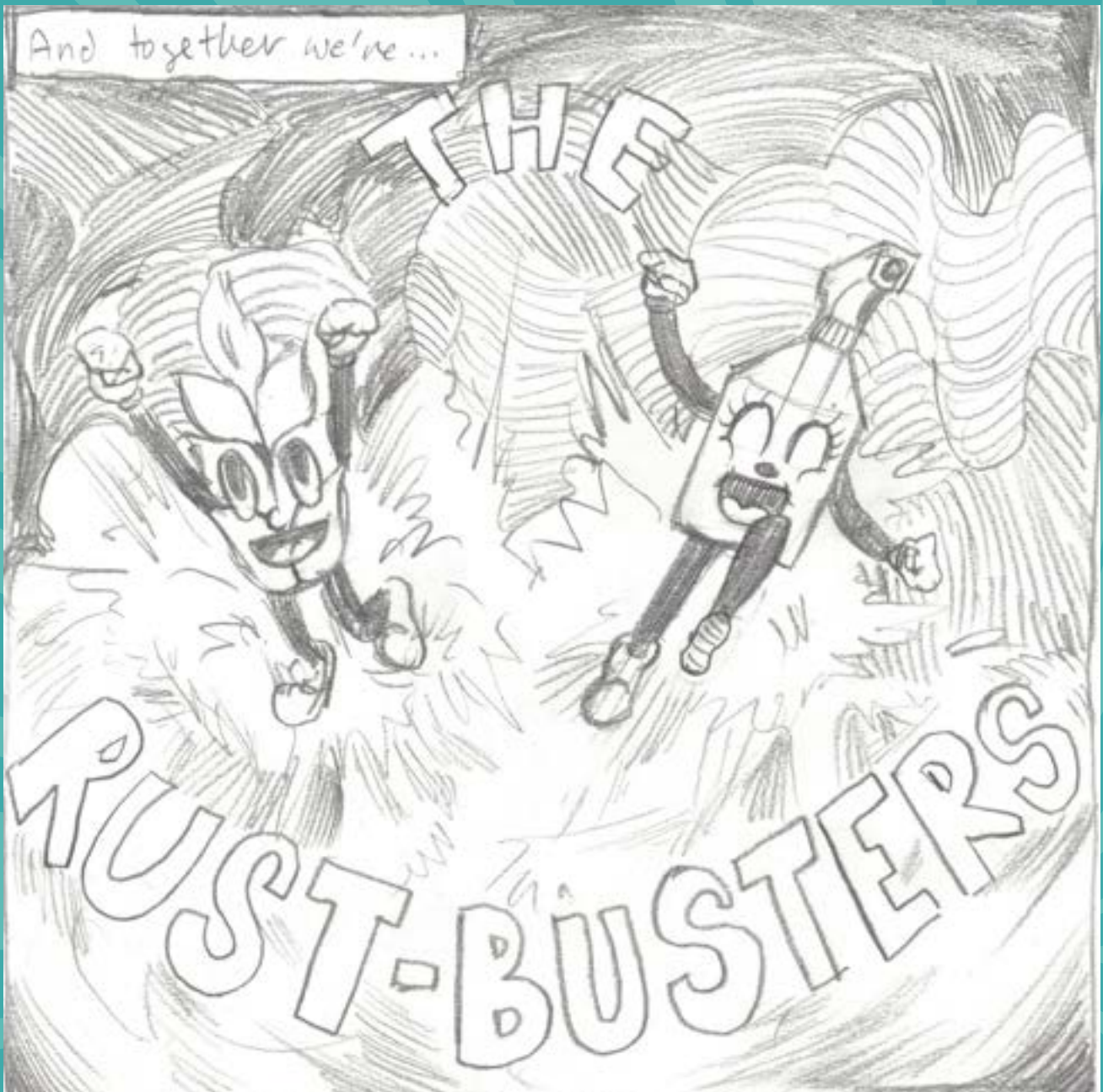




The background of the entire page is a sunburst pattern. It consists of numerous thin, light blue lines radiating from a central point in the upper left quadrant, creating a starburst effect against a darker teal background.

# **The Rust-Busters UNSW iGEM2022**





The background of the entire image is a sunburst pattern. It consists of numerous thin, light blue lines radiating from a central point in the upper left quadrant towards the edges of the frame. The lines are of varying lengths and angles, creating a dynamic, starburst effect. The overall color palette is monochromatic, using different shades of blue and teal.

**BINANOX**

Leiden

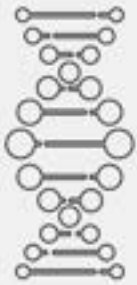
# iGEM LEIDEN 2022

## BiNANOX

1. BACTERIAL CELLS CAN TAKE UP METAL IONS, SUCH AS SILVER IONS

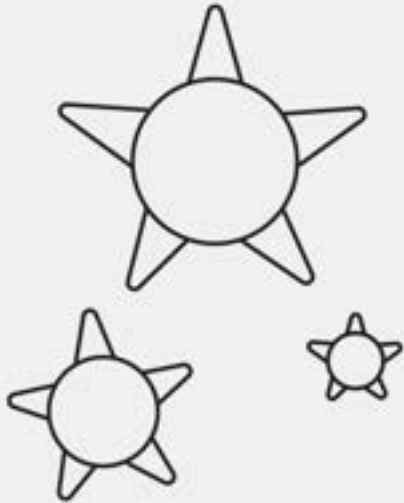


3. WE CAN MODIFY BACTERIA TO MAKE THIS PROCESS BETTER



2. THESE IONS CAN BE CONVERTED TO NANOPARTICLES (NPs). HERE WE HAVE SILVER NANOPARTICLES





**4. WE CAN ALSO USE BACTERIAL SYSTEMS TO MAKE NPs WITH TWO DIFFERENT METALS**

**-FOR EXAMPLE HERE WE HAVE A SILVER CORE WITH GOLDEN SPIKES**

**5. THESE NPs CAN BE USED TO KILL CANCER CELLS. THE NPs ARE SIMPLY DELIVERED TO THE TUMOUR**



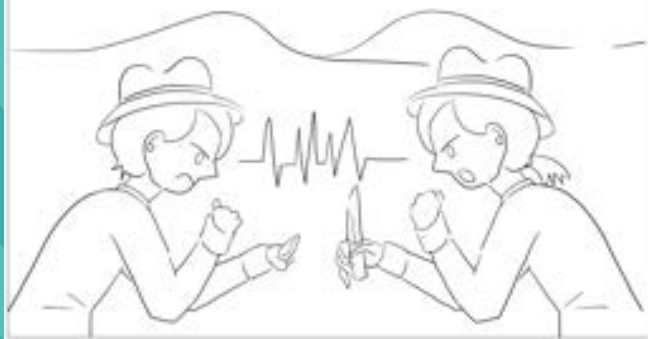
**6. THESE PARTICLES ARE THEN HEATED UP, WHICH DESTROYS THE CANCER CELLS!**



# UBX protein

## NYCU\_Formosa 2022

Once upon a time, there are two cowboys from different rivals fighting with each other since an irreconcilable conflict.



The man, Rex, eventually won the fight. However, the other man, Jay, was covered all over with cuts and bruises.



The nurse saw Jay was hurt so badly, she came to get him a wound bandage.



Soon, Jay stopped bleeding and felt recovered.



However, after three days, Jay felt his hand hurt. Suddenly, he found that the wound started bleeding again.



He removed the bandage and found that the wound just got inflamed!!





It turned out that the bandage was so airtight and inelastic that the wound was infected with bacteria and was purulent!



Just then, a girl from the future named Vivian appeared with a magic protein called "UltraBithoraX".



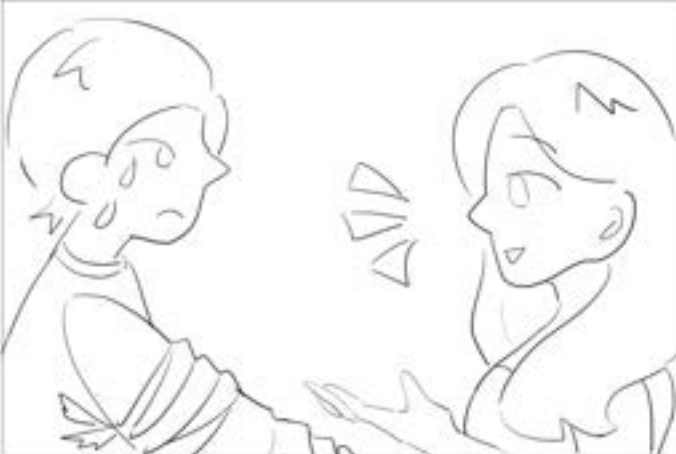
She used the UBX protein and antimicrobial peptides to make a antibacterial bandage.



The bandage made up of UBX protein is elastic and biocompatibility. It would not caused the infection again!



Vivian quickly dressed his wound and told him the magic power of UBX protein.



Soon after, the cut on Jay's arm was completely healed !!! Thank you, UBX protein, thank you, Vivian!

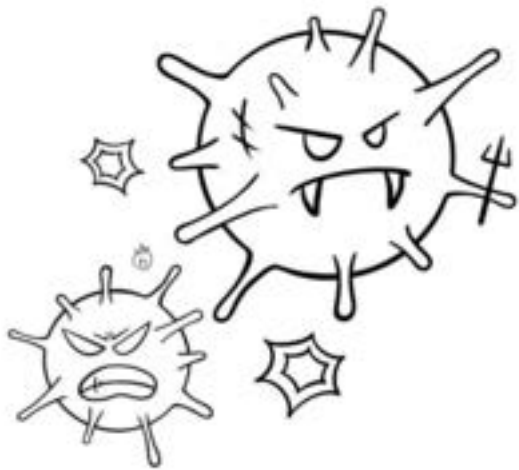




# Antibody

## CSMU Taiwan

Once upon a time, a group of viruses attacked the Earth. They brought a horrible pandemic to human society and made the public panic.



In order to beat them and save lives, scientists produced a legion of monoclonal antibodies to fight against these evil gangsters.



The viruses and antibodies had a fierce fight. However, the antibodies were beaten down, and failed to stop the viruses from infecting human beings.



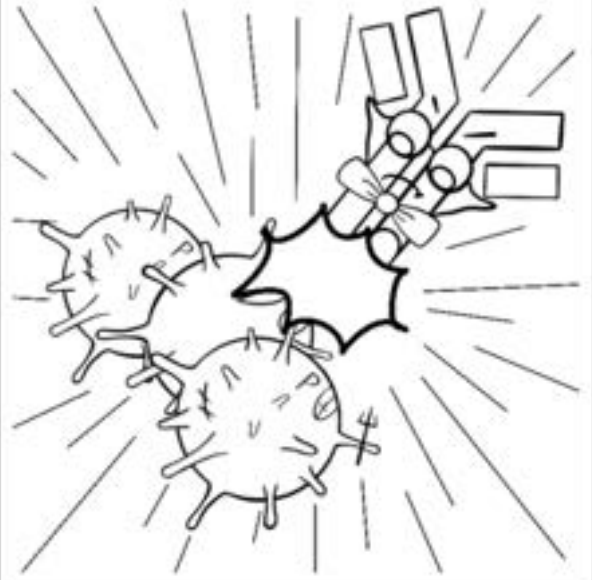
After the antibodies were defeated, scientists found a special component named AID, which could help optimize the antibody producers.



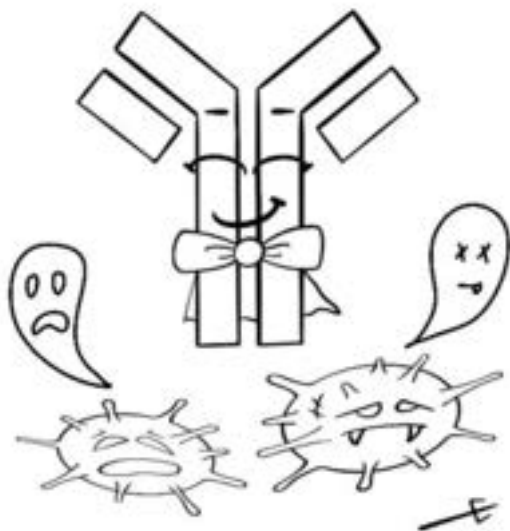
The optimized antibody producer improved the combat effectiveness of the antibodies, and made them brand-new antibodies.



Becoming stronger, the new antibodies legion challenged the viruses again, and got them into trouble.



Finally, the new antibodies won the battle, killed all the viruses and saved everyone from suffering from the distressing epidemic.



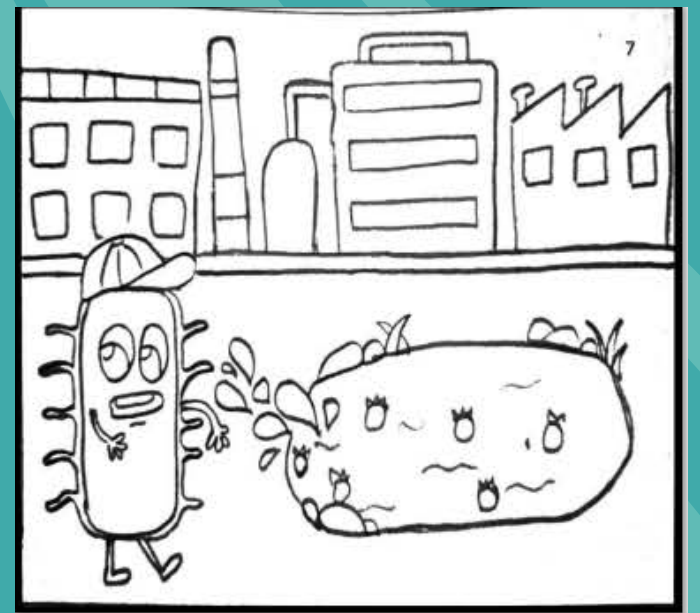
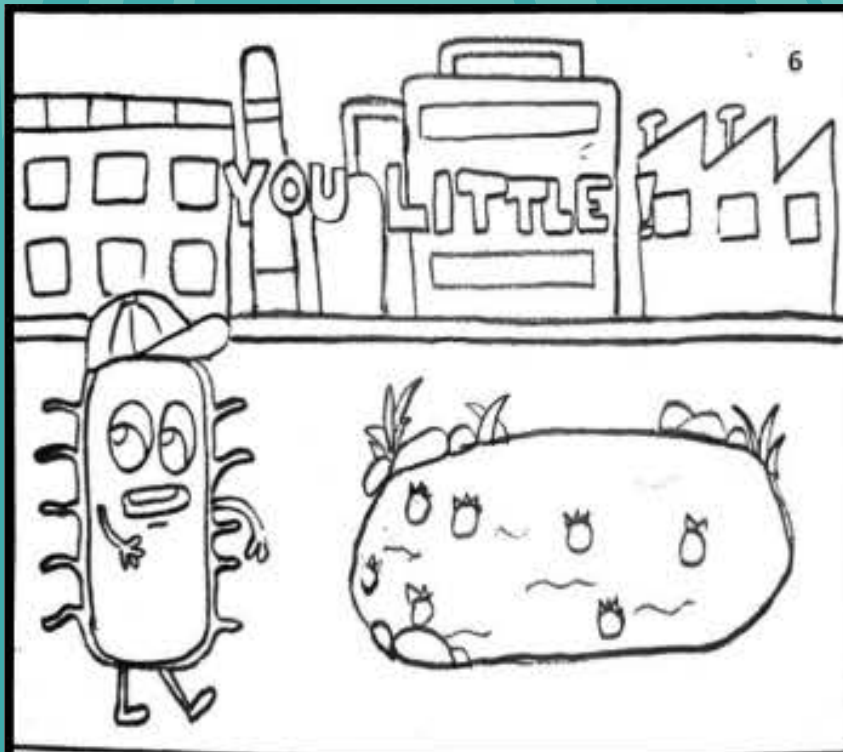
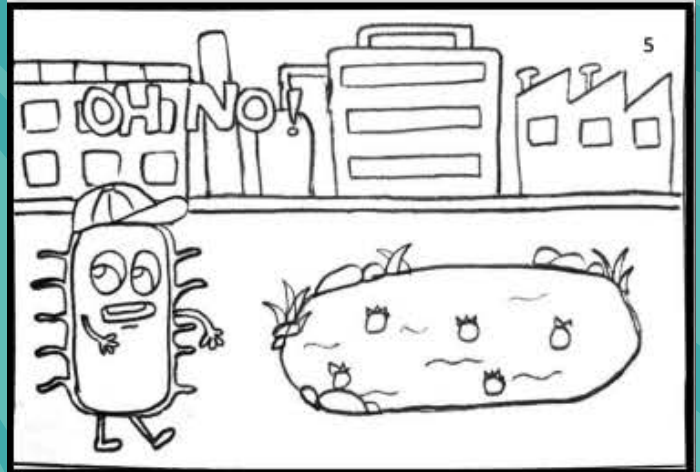
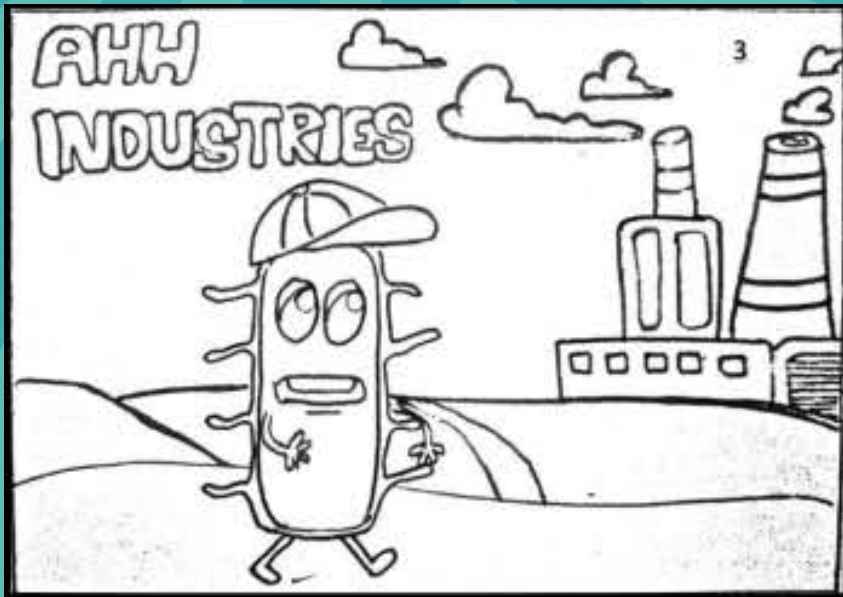
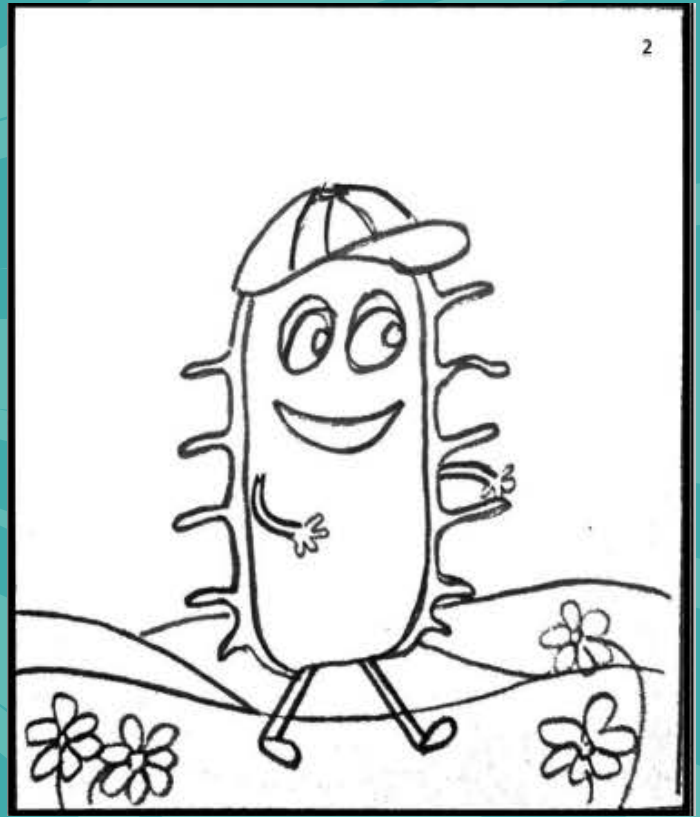
Thanks to the new antibody producer and new antibodies, the Earth and human beings living on it could live happily ever after.

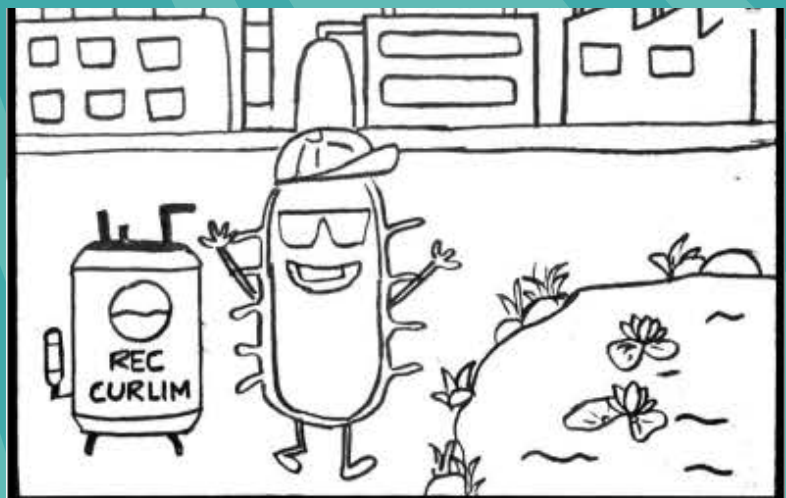
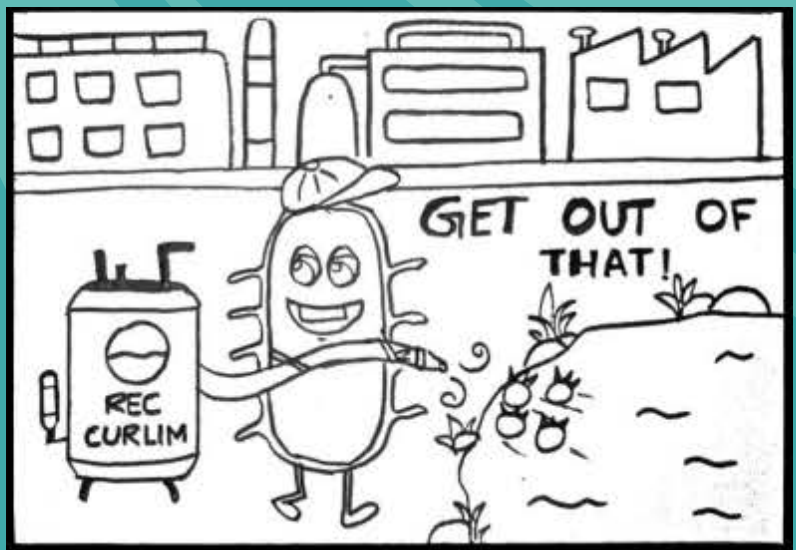
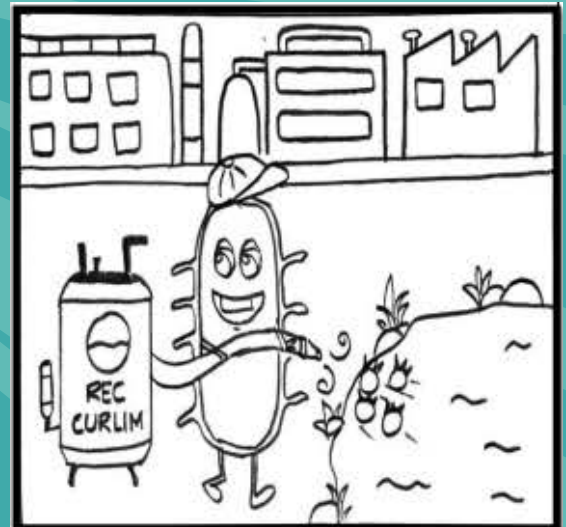
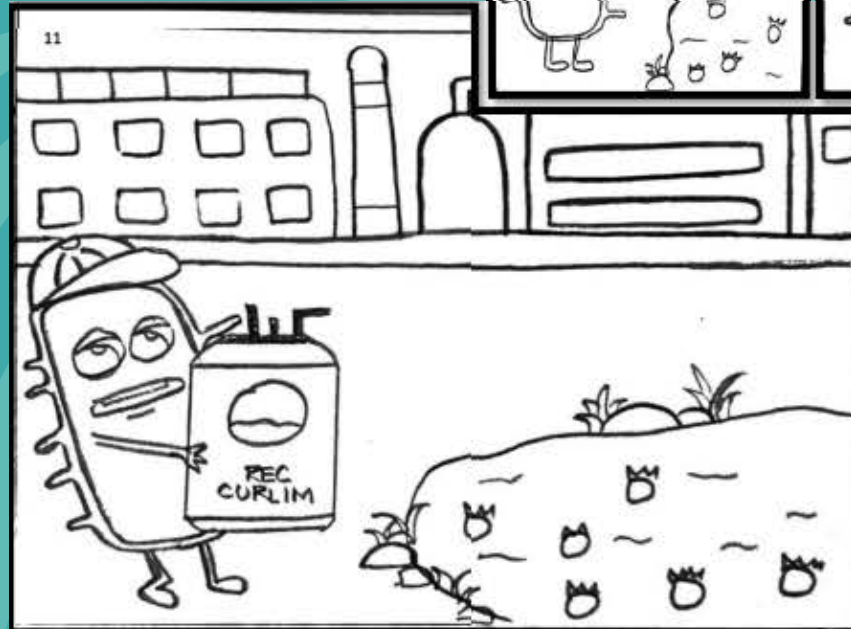
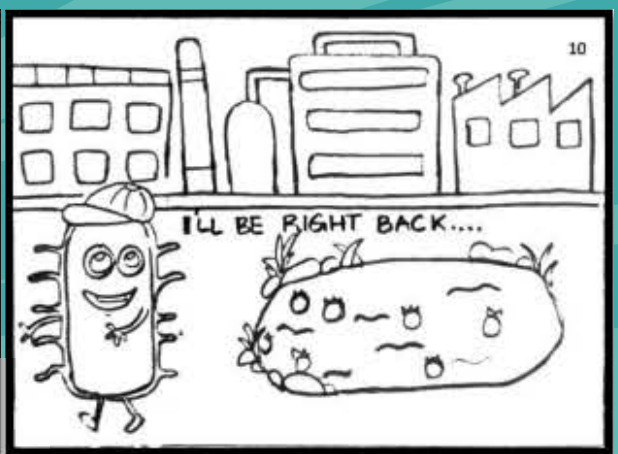
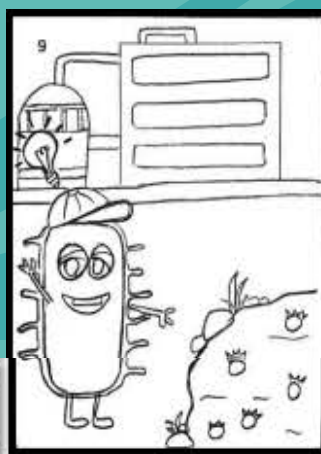
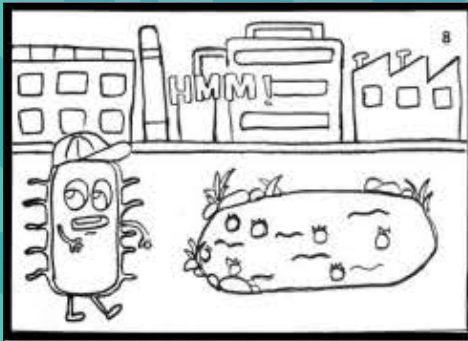




# Industries

## REC CHENNAI





**THE END**



**CADlock**  
**Lambert\_GA**

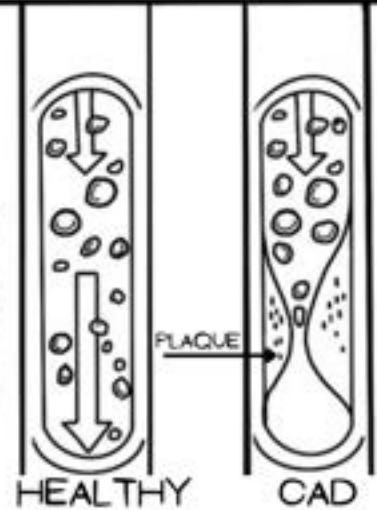
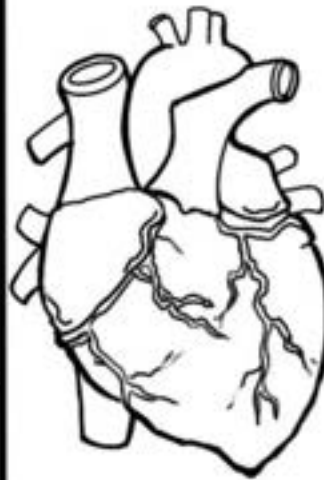


ON EARTH, 11 MILLION DEATHS OCCUR EVERY YEAR DUE TO...



CORONARY ARTERY DISEASE (CAD)

IT IS A HEART CONDITION WHERE THE CORONARY ARTERIES (MAJOR BLOOD VESSELS) STRUGGLE TO SEND BLOOD TO THE HEART. THIS IS CAUSED BY PLAQUE BULDUP IN THE ARTERIES.

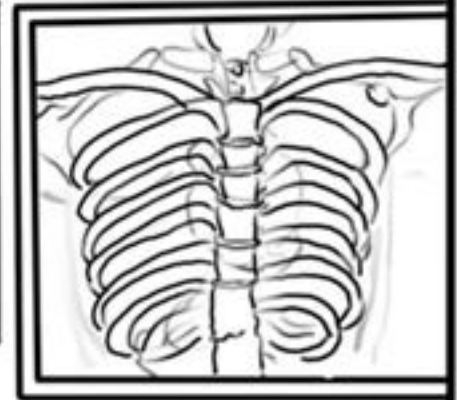
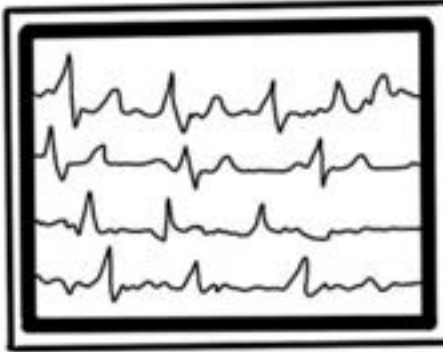


HEALTHY

CAD

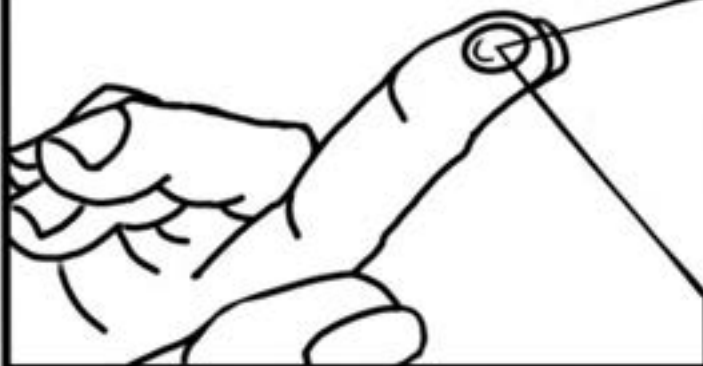
NOT ONLY DOES THIS CONDITION CAUSE DISCOMFORT, BUT CAD CAN ALSO WEAKEN THE HEART MUSCLE AND LEAD TO ITS FAILURE...

CURRENT METHODS USED TO DIAGNOSE THIS DISEASE INCLUDES CHEST X RAYS



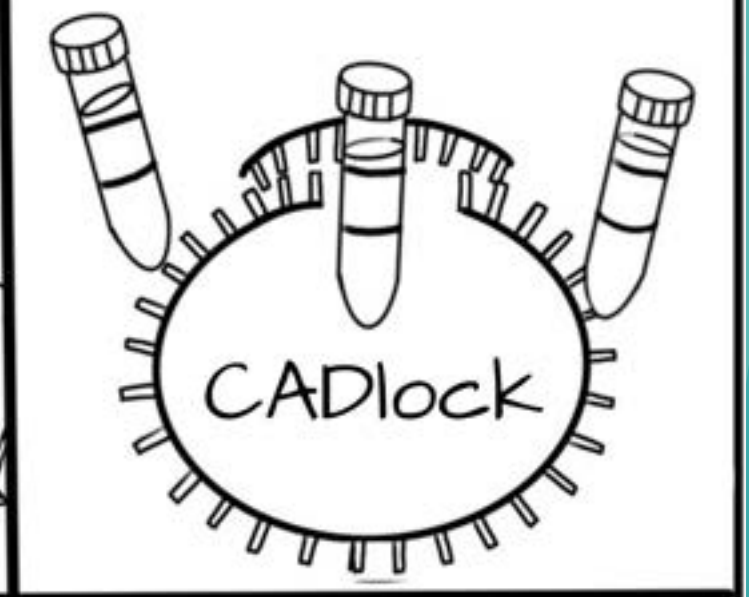
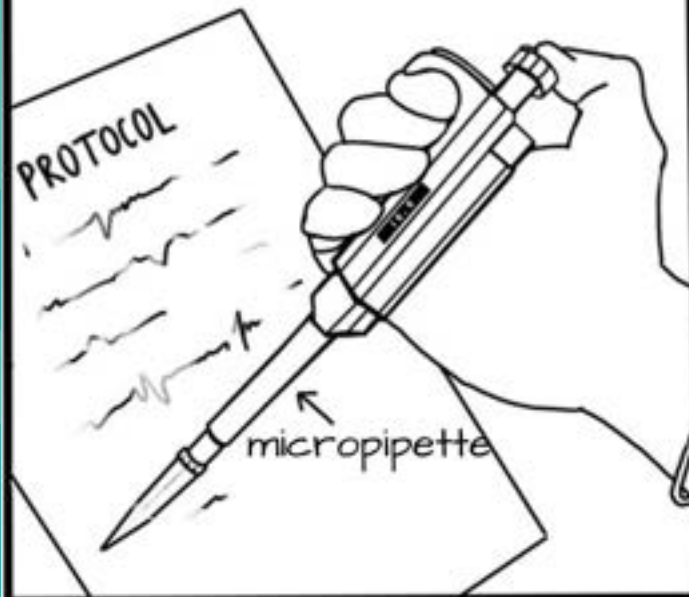
BUT WHAT IF THERE WAS ANOTHER WAY ?

A POTENTIAL ANSWER IS FOUND IN THE BLOOD...



microRNAs!

Lambert iGEM IS USING RESEARCH ON THE ROLE OF microRNAs IN CAD AND SYNTHETIC BIOLOGY TO DETECT microRNA LEVELS IN BLOOD SERUM!



TESTING COULD THEN BE DONE IN HOSPITALS AND AID DOCTORS IN THE DIAGNOSIS OF CORONARY ARTERY DISEASE.



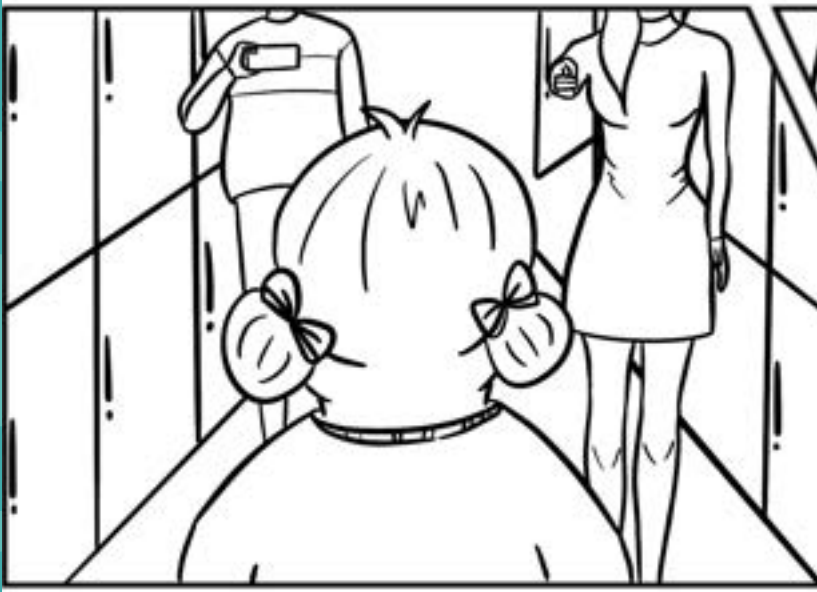
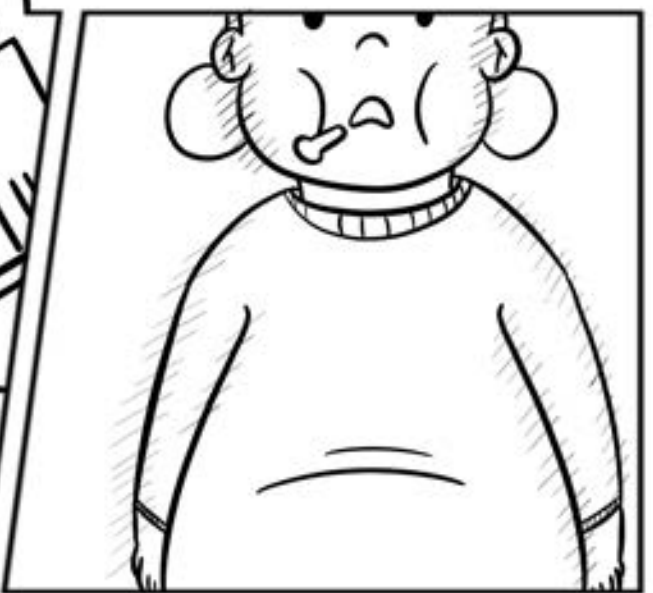
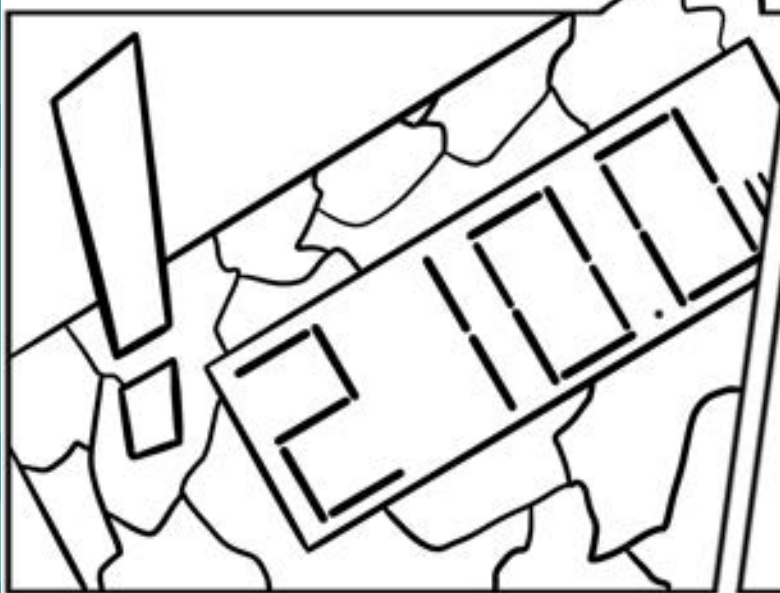
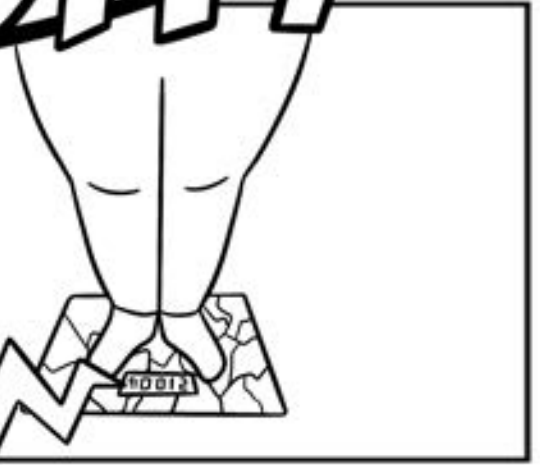
FOR A HEALTHIER AND HAPPIER WORLD!

The background of the entire image is a sunburst pattern. It consists of numerous thin, light blue lines radiating from a central point in the upper left quadrant towards the edges of the frame. The lines are of varying lengths and angles, creating a dynamic, starburst effect. The overall color palette is a range of light blue and teal tones.

**NOBESITY**

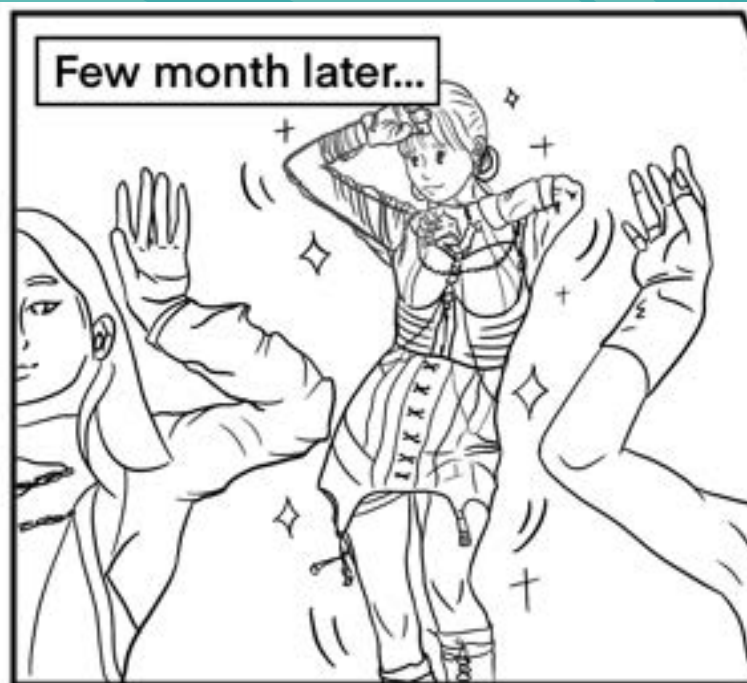
**KCIS XIUGANG  
TAIPEI**

# NOBESITY





Few month later...



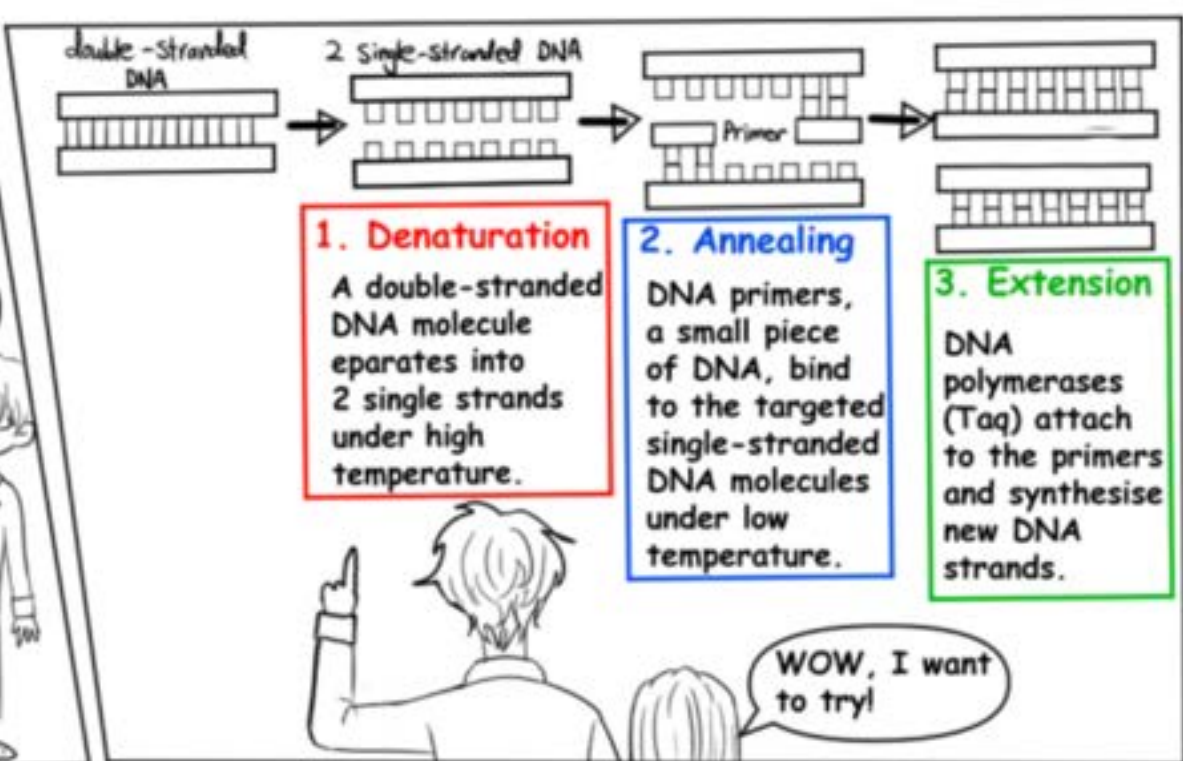
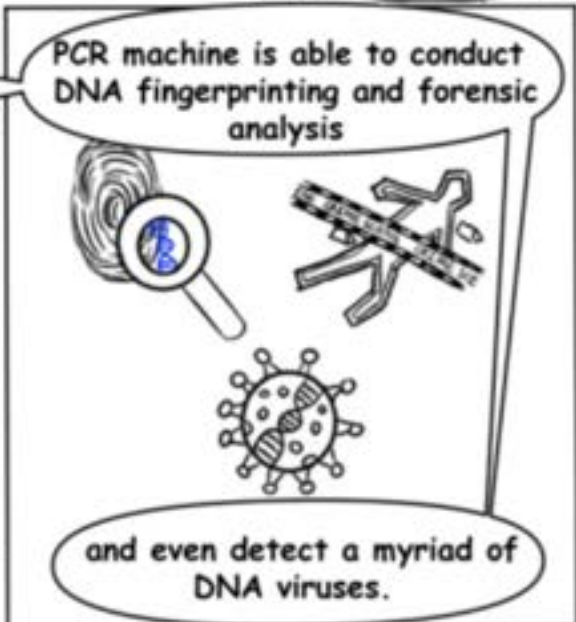
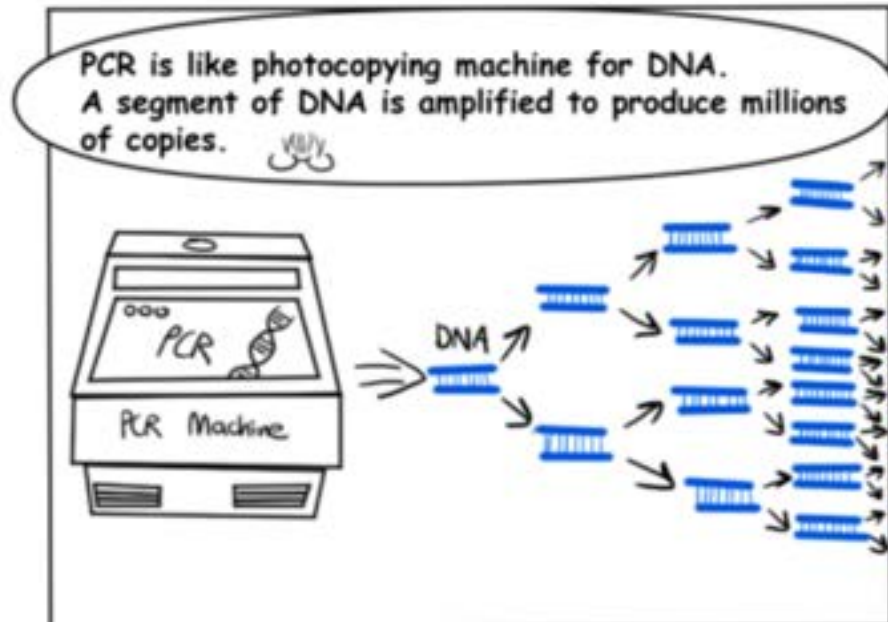
And it all started from...





**PCR**

**CityU**  
**Hong Kong**

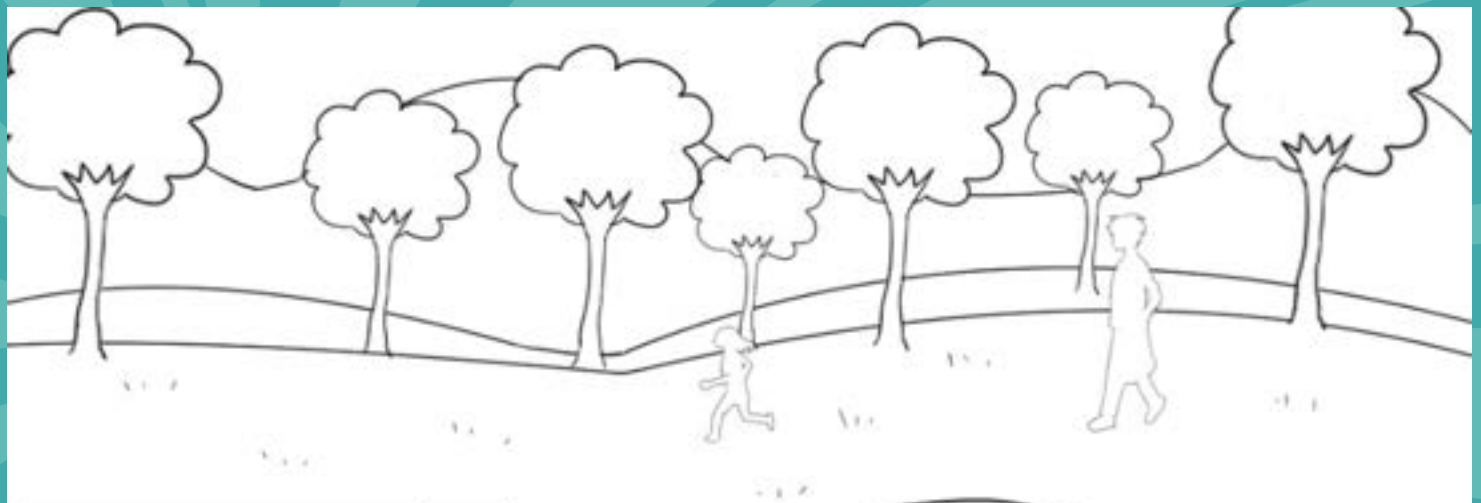




**Fungus**

CityU  
Hong Kong

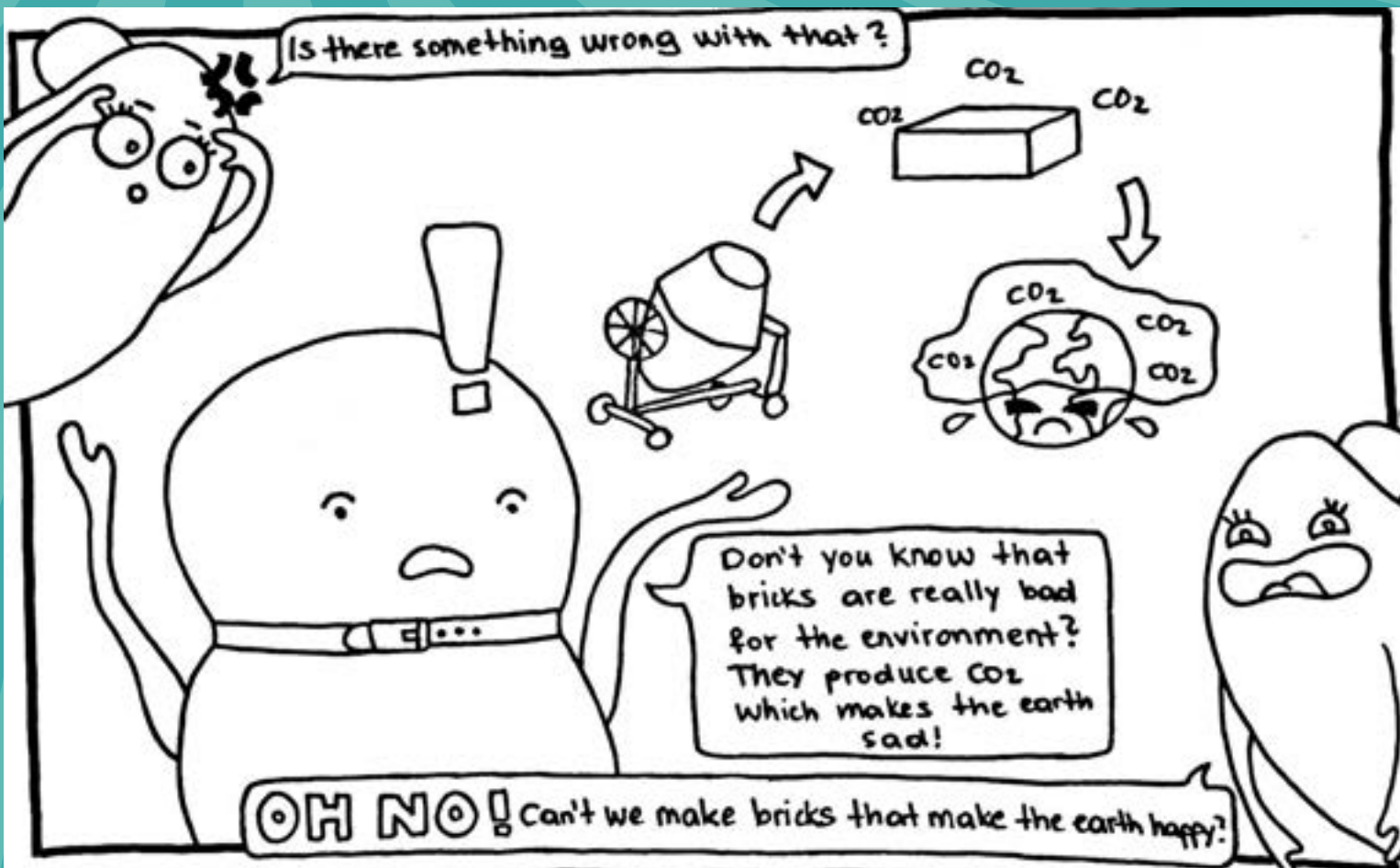
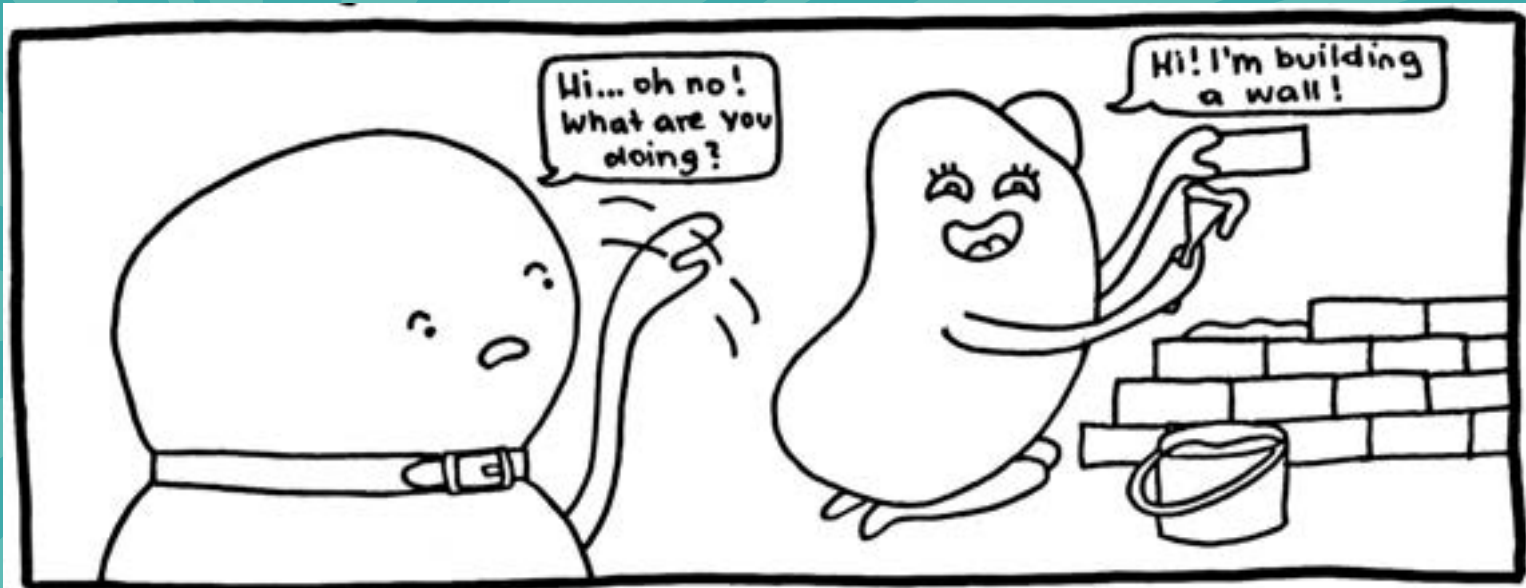




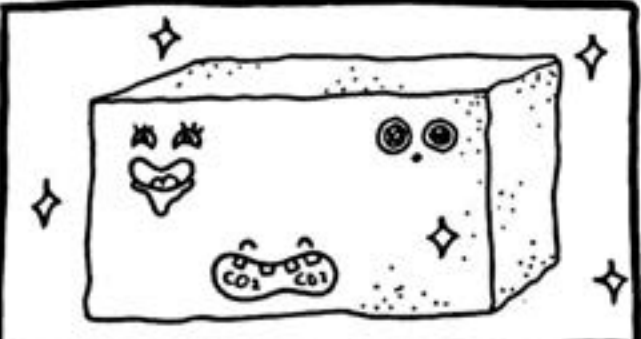
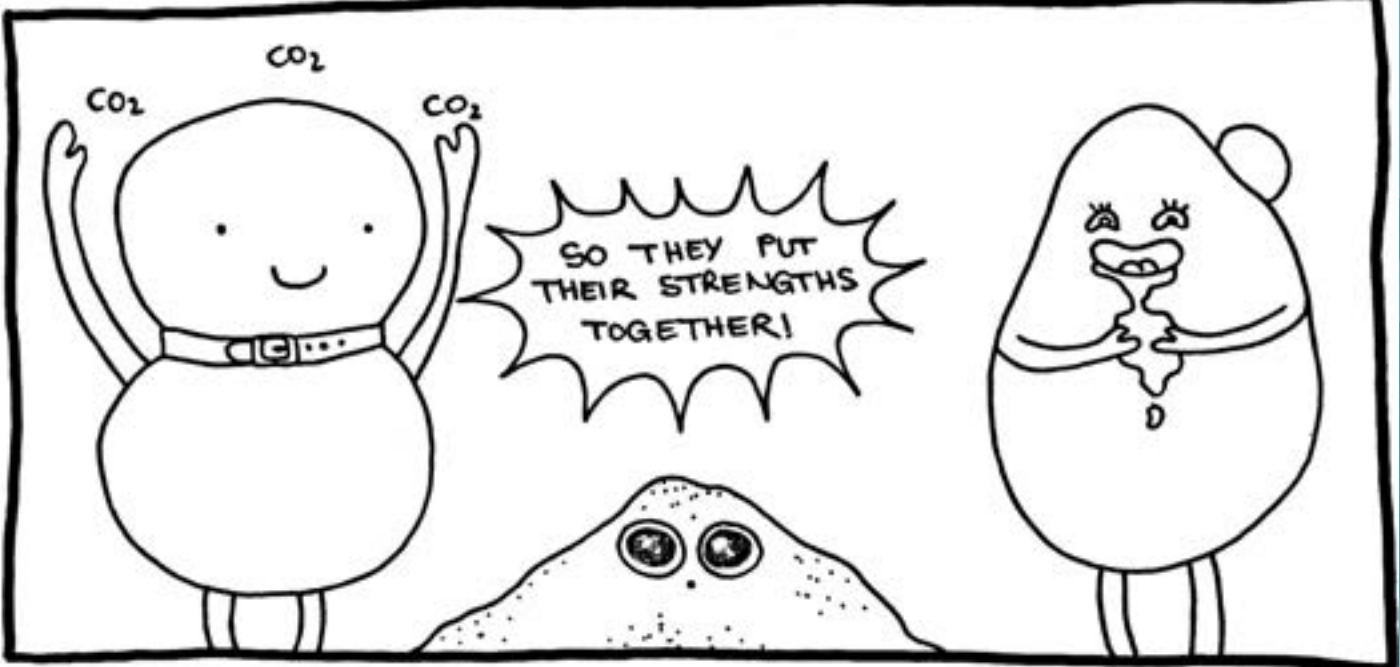
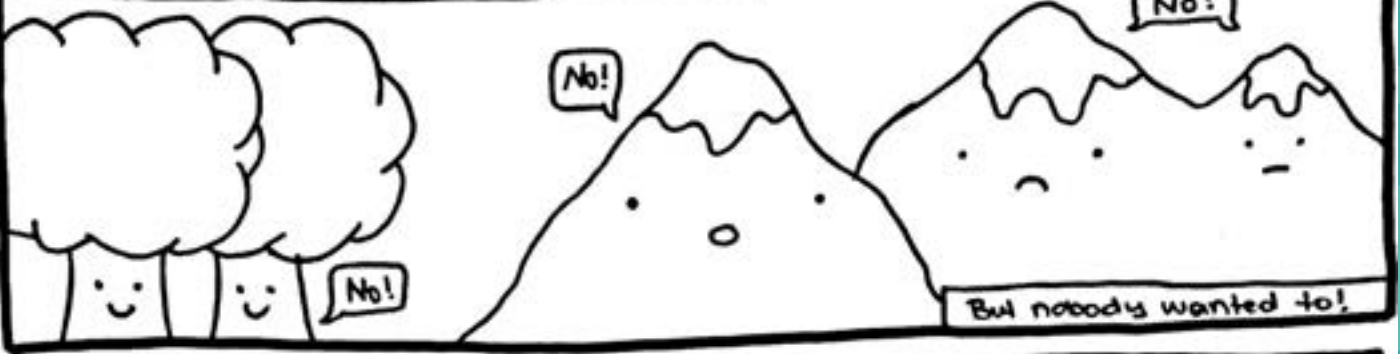


# Pichitecture

## igem vienna



So they looked for more earthlings to help!



A sustainable brick was born...



...and the earth was happy!

The background of the entire image is a sunburst pattern. It consists of numerous thin, light blue lines radiating from a central point at the top left, creating a starburst effect against a darker teal background. The lines are evenly spaced and extend across the entire frame.

**Did you know?**

**GYHS**

# Do you know...?



bacteria phage



GFP  
green fluorescent protein

nano magnetic bead complex



They only RBP catch a specific type of bacteria (e.g. gp13)



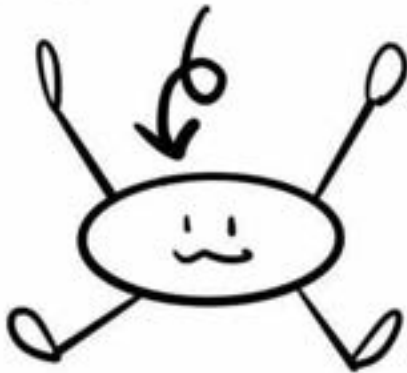
GFP: Showing green Light under blue light!





# Paper-based sensor GYHS

# paper - based sensor

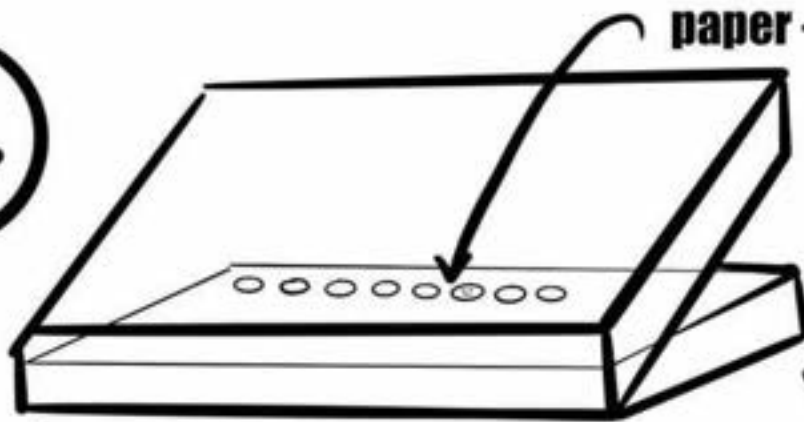


① chromogenic sub-strate

ADDED



②



paper - based sensor

Place in 37°C incubator

DRY UP!

Sample

③



30 min ...



④



positive color change  
negative color X change



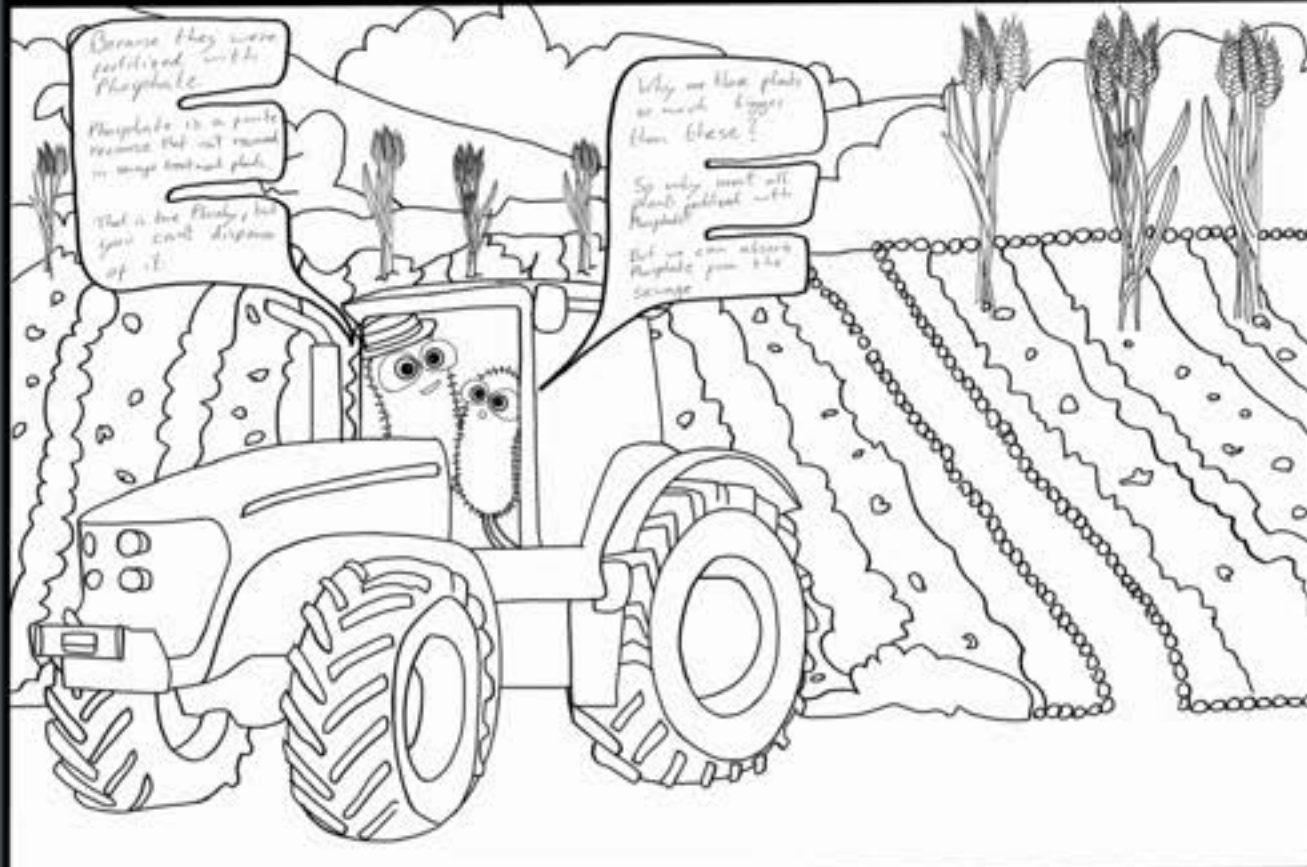
**How can I  
dispense the  
phosphate?**

**iGEM AACHEN**



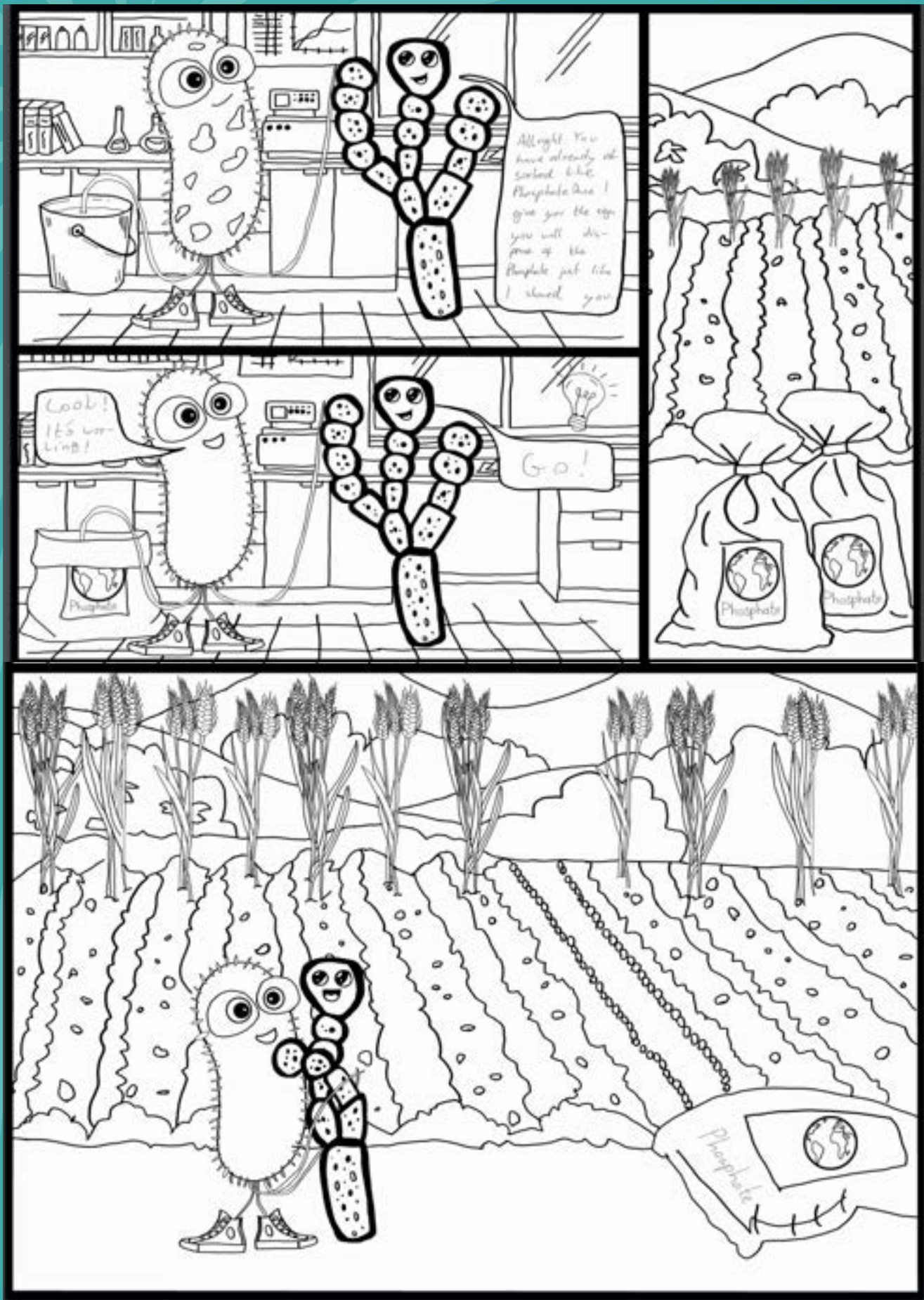
# iGEM

AACHEN 2022



How can I dispose of the phosphate?  
Maybe my friend Norm can help/she's capable of absorbing a lot of things from sewage and disposing them to!





# Endocrine disruptors

TECCEM

One day Lettie (a beautiful and little lettuce) was enjoying her new life in the fertile ground. She had always enjoyed the fresh water in her leaves.



One day she noticed that the water she received was full of toxic compounds. She knew this because her leaves started to get dark and fragile.



Lettie started looking for help on web sites. Fortunately, she found a one full of Mexican scientists that created a system to detect and eliminate the contaminants, this page was called "iGEM TEC CEM".



Lettie contacted them to ask for help. These scientists were happy to help, so they prepared their armor to attack.



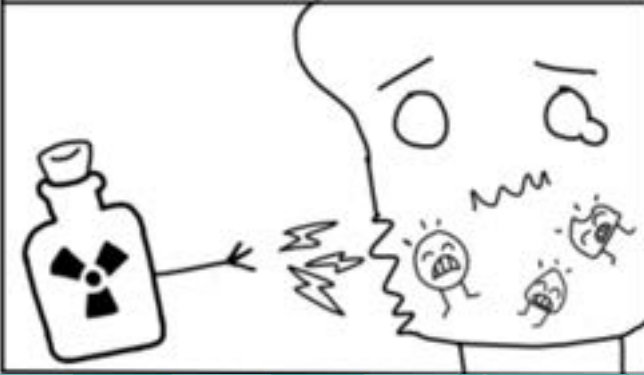
Lettie was surprised about the incredible armors the scientists had developed. One of them was a potent protein called "Hery" that could reveal the identity of the toxics.



And the other armor allowed the elimination of these toxics with the action of the powerful Lacassie, who is a remarkable enzyme with super elimination powers.



First, Hery determined that these toxics are called endocrine disruptors, and that their malignancy actions consist of affecting the hormones of the plants and thus affecting the growth of them.



Lettie felt sad when she heard that, but Lacassie calmed her down and told her that she will handle it.



Then, Lacassie did her job and endocrine disruptors abandoned the field.



Lettie and her friends were very grateful and gave the scientist a great hug!



Scientists, Lacassie and Hery said bye and promised to come back if another enemy ever arrived again.





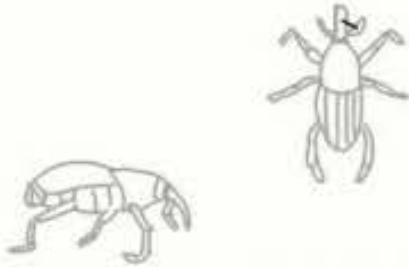
**SPIDICIDE**

**UAM**

Nopal is one of the main sources of income in our country!



But we had a problem:  
"El picudo barrenador"

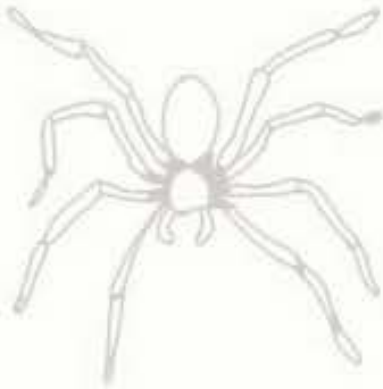


It's an insect from the family "colioptera" who has become a plague and is harming the nopal fields

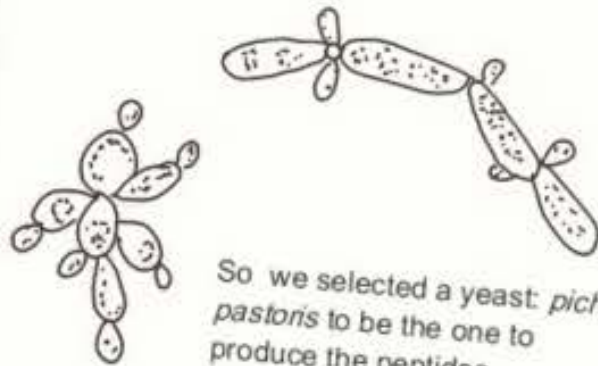
So we came up with  
and idea:



The first part of this idea was that its natural predators, (the spiders) produce a poison that could be used against the picudo.



And the second one, was that using synthetic biology we could modify an organism to produce the two peptides that make the poison deadly to the picudo.



So we selected a yeast: *pichia pastoris* to be the one to produce the peptides

And after working diligently on the lab .....



That is how SPIDICIDE came to be !!!!

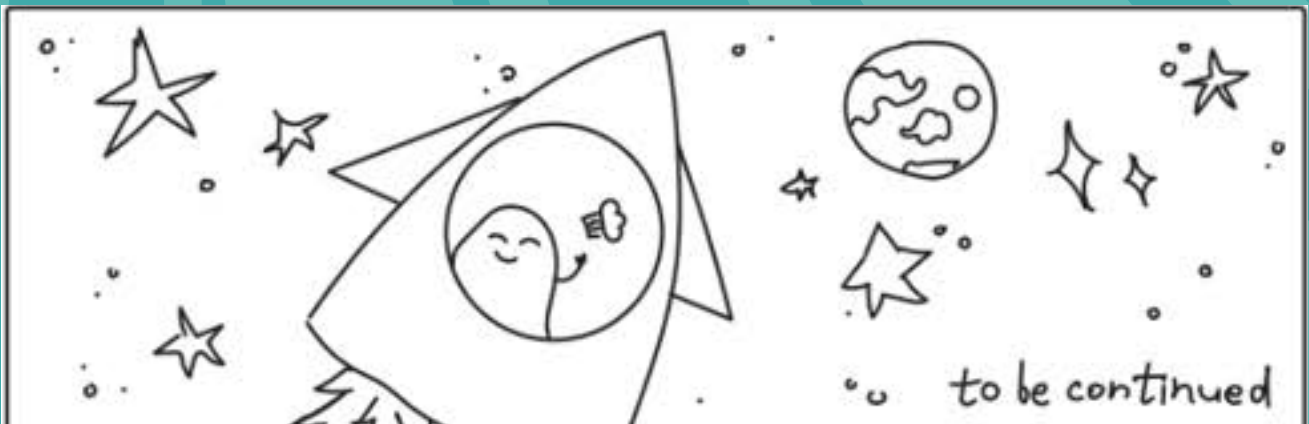
A Biopesticide that is specific and non-harmful for the environment



The background of the slide is a sunburst pattern with multiple rays emanating from a central point in the upper left, creating a dynamic, radiating effect. The rays are in various shades of teal and blue.

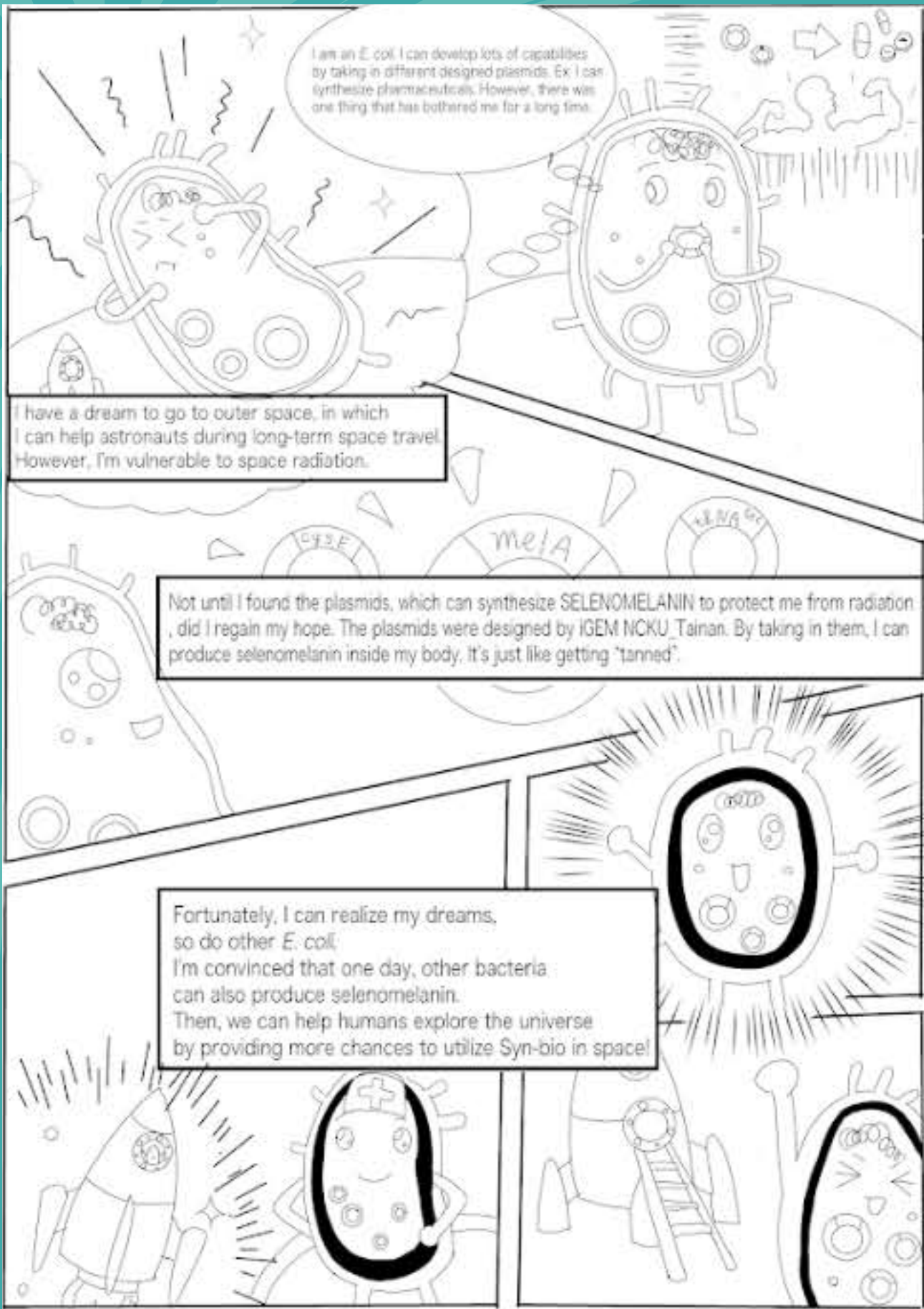
# **Yeast resistant to radiation**

**Estonia\_TUIT**



**SELENOMELANIN**

**NCKU-Tainan**



I am an *E. coli*. I can develop lots of capabilities by taking in different designed plasmids. Ex: I can synthesize pharmaceuticals. However, there was one thing that has bothered me for a long time.

I have a dream to go to outer space, in which I can help astronauts during long-term space travel. However, I'm vulnerable to space radiation.

Not until I found the plasmids, which can synthesize SELENOMELANIN to protect me from radiation, did I regain my hope. The plasmids were designed by iGEM NCKU Tainan. By taking in them, I can produce selenomelanin inside my body. It's just like getting "tanned".

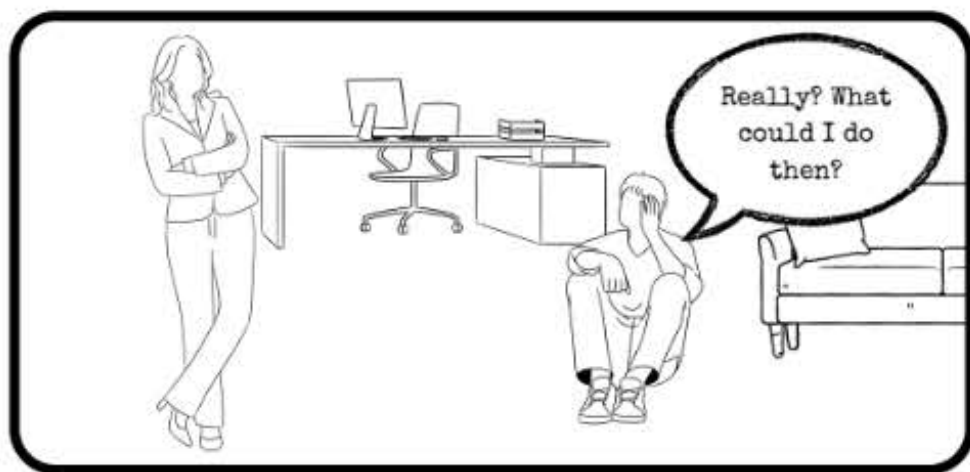
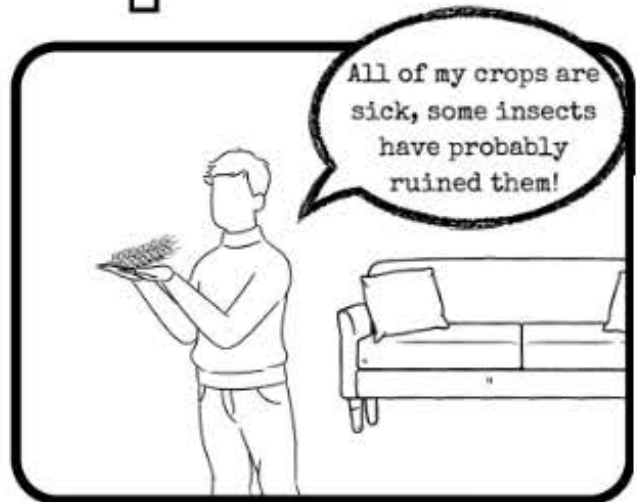
Fortunately, I can realize my dreams, so do other *E. coli*. I'm convinced that one day, other bacteria can also produce selenomelanin. Then, we can help humans explore the universe by providing more chances to utilize Syn-bio in space!

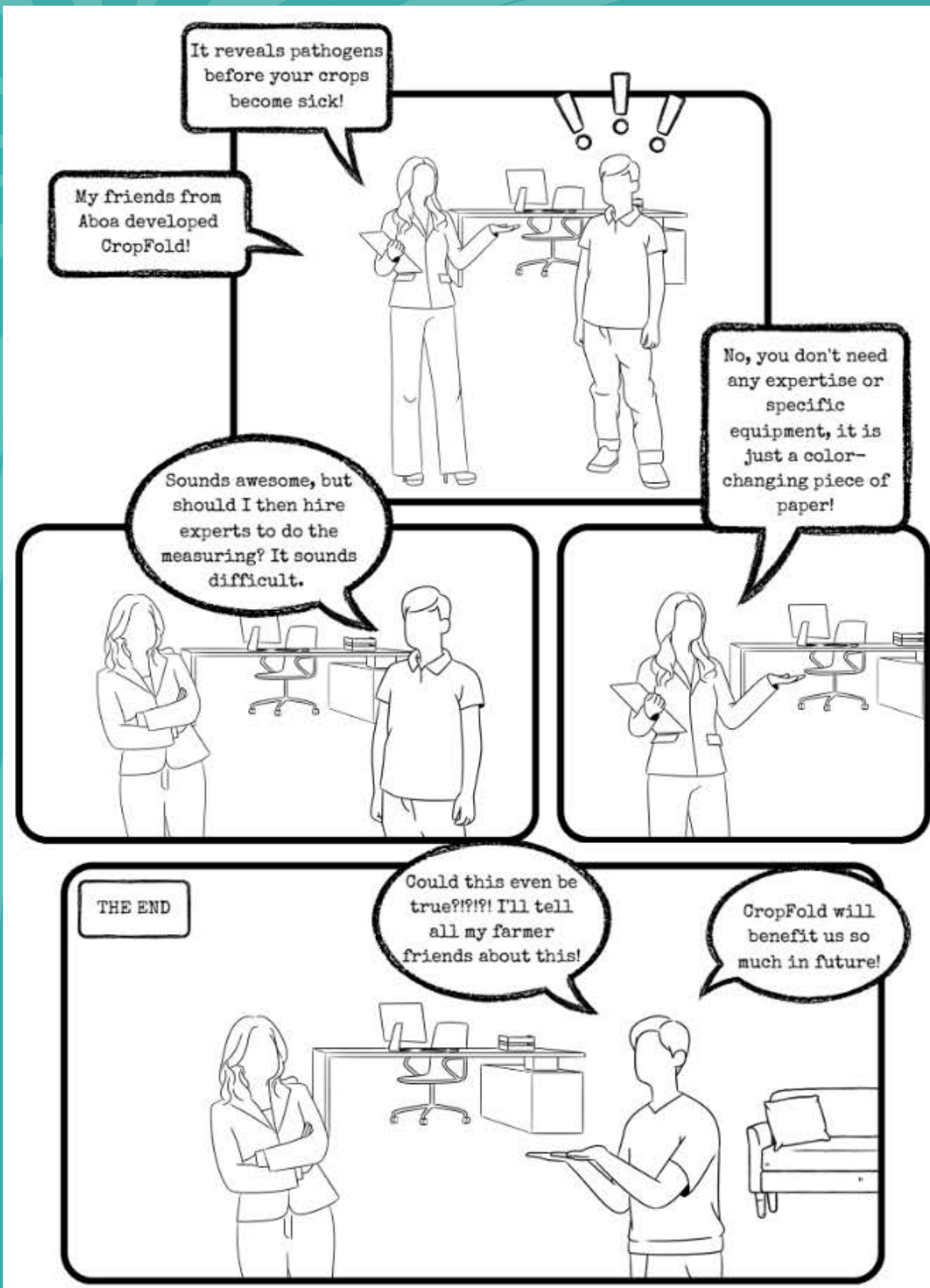
The background of the slide is a vibrant teal color with a sunburst or starburst pattern. The rays of the sunburst originate from the top-left corner and radiate outwards across the entire page, creating a dynamic and energetic feel.

# Problems in the farm- CropFold

Aboa

# Problems in the farm - CropFold





It reveals pathogens before your crops become sick!

My friends from Aboa developed CropFold!

Sounds awesome, but should I then hire experts to do the measuring? It sounds difficult.

No, you don't need any expertise or specific equipment, it is just a color-changing piece of paper!

THE END

Could this even be true?!?! I'll tell all my farmer friends about this!

CropFold will benefit us so much in future!

The background of the slide is a vibrant teal color with a sunburst or starburst pattern. The pattern consists of numerous thin, light-colored lines radiating from a central point at the top, creating a sense of energy and focus.

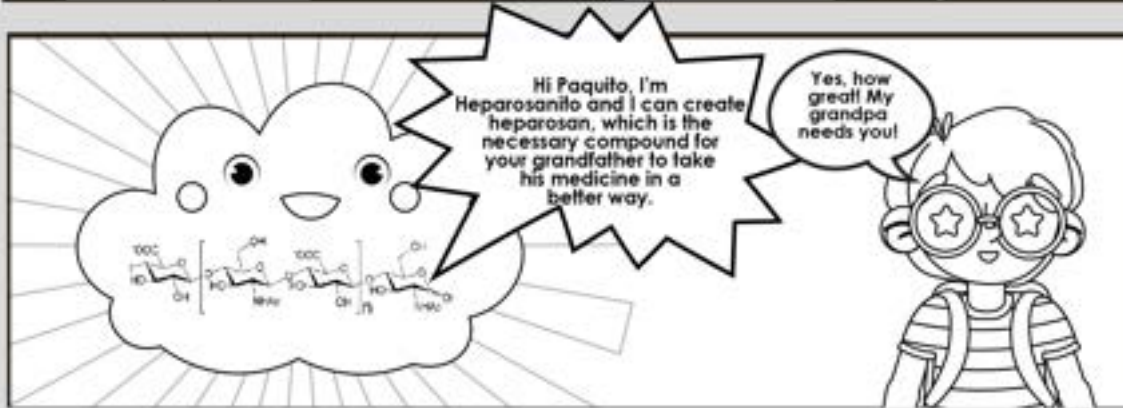
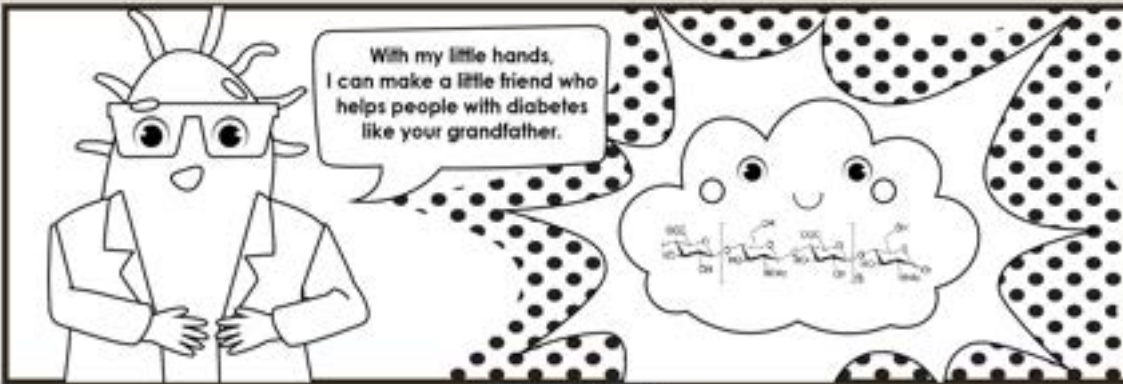
# Heparosanito

## Biotech EC



# HEPAROSANITO





iGEM Biotech EC  
Team Design League 2022





**AcidOceanus**

**UM\_MACAU**

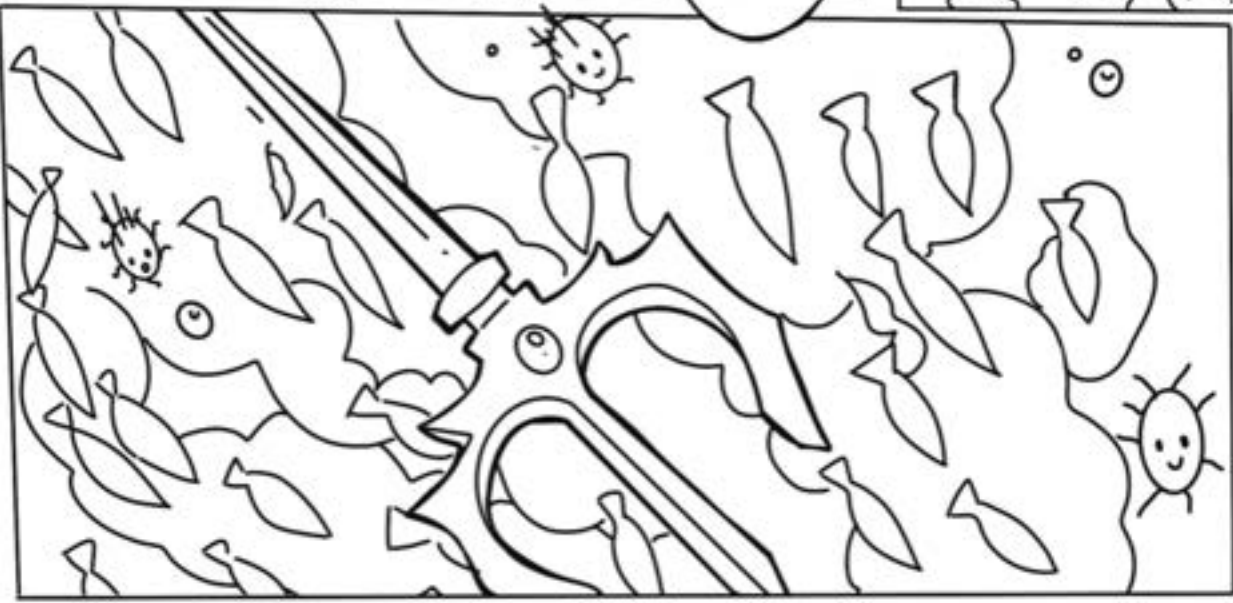
Morfy, are you ok? You look so pale!

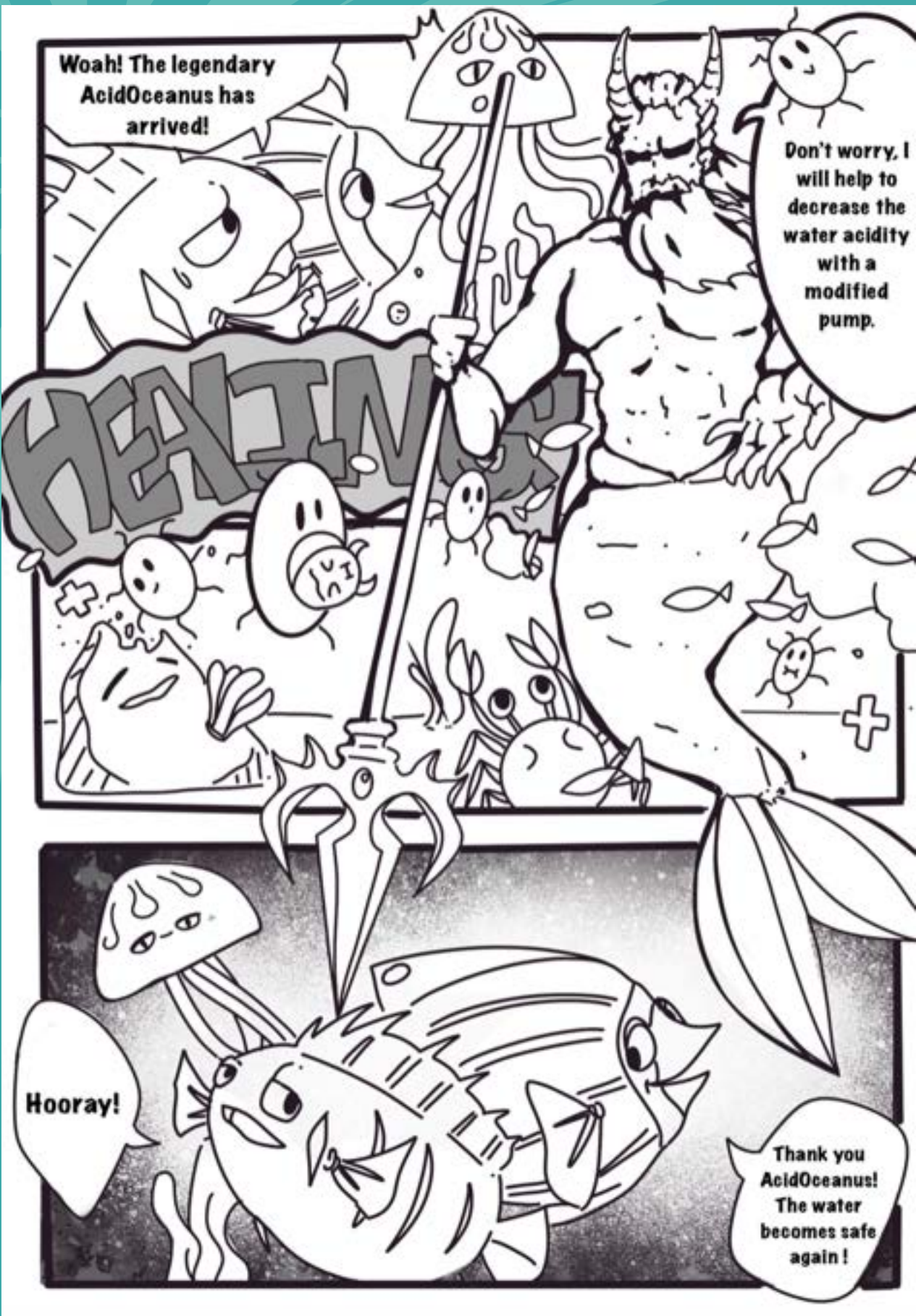
Maybe! It's getting more acidic than before!

Acid

Oh No! The protons are acidifying the water, more of our friends are dying because the water is too acidic for them!

Where is AcidOceanus? I once heard that he has the ability to control the acidity of the water, only he can save us now!





Woah! The legendary AcidOceanus has arrived!

Don't worry, I will help to decrease the water acidity with a modified pump.

**HEALTHY**

Hooray!

Thank you AcidOceanus! The water becomes safe again!