

# Now that's cool, but why is it doing that?

## What are Bacteria?

Bacteria are very tiny organisms made of just one single cell. They are one of the oldest living creature on earth and till this day, causing all sorts of trouble (and good!) to our human body. Although they are too small for us to see with our naked eye, our body are actually full of different kinds of bacteria. Our body's **immune system** is constantly battling harmful bacteria from making us ill, on the other hand, our digestive system has learned to coexist with the good type of bacteria that actually help turning the food we eat into nutrients!

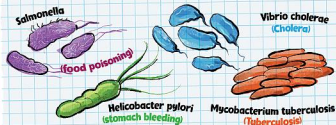
**Probiotic foods** contain live bacteria that are good for you, especially for your digestive system. Here are some that you can find easily:



Yogurt, Natto (fermented soybeans), Sauerkraut



## Famous Troublemakers



## Keeping Harmful Bacteria Away!

It is important to practice good hygiene to prevent the spread of diseases. Because bacteria are invisible, your hands often carry and spread bacteria unwantedly to food, and body parts making you and other people ill. Wash hands thoroughly with soap before and after you prepare food, and especially after going to the toilet. Soap works fantastically against bacteria because it destroys the fatty layer on the outside of the bacteria, essentially breaking it apart!

## How do Bacteria grow?

The petri dishes we prepared for growing bacteria contains a lot of nutrients, or food for the bacteria to reproduce and grow. Normally, their numbers are limited at the places where you sampled them because there isn't enough food for them to grow into large amounts.

Bacteria reproduces by **cell division**, which literally means they split to make a copy of itself. Under the right conditions, their number can double every 20 minutes! As the bacteria consume the food of the Petri dish, they can grow into a **colony**, a large population of the same kind of bacteria that becomes visible to our eye.



## Take a Look at Your Petri Dish...

After a few days there should some spots and patches appearing on your Petri dish. Here are some ways that could help you understand what is going on inside.

**First of all, do you know bacteria is not the only tiny organism living in the wild?**

- **Bacteria** colonies look like circle spots, and each spot comes from a bacterial cell or group that has divided repeatedly. They are usually white, yellow, orange or brown in colour.
- **Yeast** is another common tiny organism and they are also a vital ingredient in bread making! Their colonies are usually white spots or patches with a shiny surface
- **Molds** are easily seen when food goes bad. You should have seen greenish spots appearing on a piece of moldy bread. They have whitish fuzzy edges and usually turn into a different colour (like green or brown) in the center.



# Biochemistry Collection BACTERIA GROWING SET

## Included Materials

- 3 Petri Dishes
- 3 Tracing Cards
- 3 Collecting Vials
- 3 Cotton Swabs
- 1 Plastic Cup
- 1 Small Magnifier
- 1 Pipette
- 1 Stirring Rod
- 1 Pair of Gloves
- 1 Pair of Goggles



## Safety Precautions

- This science activity involves the use of boiling water. Hot water must only be handled by an adult.
- Wear goggles at all times during the experiment to prevent liquid and contaminants entering the eye.
- Wear gloves at all times while you collect the bacteria and transferring the bacteria to the Petri dish.
- Wash your hands thoroughly before and after the experiment.
- Never open a sealed Petri dish and dispose it in a sealed plastic bag after the experiment.

## You will need to prepare:

- The ideal growing agent for bacteria is agar, which is also the substance for growing bacteria in professional laboratories! Agar can be found in Asian supermarkets or grocery stores. Another option is to use gelatin, however natural gelatin is not as nutritious as agar therefore we need to add extra ingredients to stimulate growth for the bacteria.
- Scissors
- Permanent Marker
- Isopropyl Alcohol

# Procedure

## Prepare the Petri Dishes

You will need to prepare:

- 1 teaspoon of Agar powder
- 100ml of water in a Small Saucepan and stove for boiling and mixing the growing agent

If you are having trouble finding agar, you will need to prepare the following ingredients as well:

- 1 teaspoon of gelatin
- 1 teaspoon/ 1 cube of beef stock (can be purchased at supermarkets or grocery store)
- 1 teaspoon of sugar



You will need adult supervision for handling alcohol & hot liquid.

**1** Take the lids off the petri dishes and clean the insides with isopropyl alcohol. Put the lids back immediately after cleaning.

**2** Measure and pour 100ml of water into the saucepan and bring to a boil.

**3** Add the agar powder to the water. OR if you are using gelatin, add the beef stock powder, sugar and gelatin to the boiling water and stir for a minute until all the ingredients have dissolved.

**4** Cool your mixture for 5 minutes. The mixture needs to be still hot to avoid it setting in the saucepan (becoming jelly-like).

**5** Take the lid off the Petri dishes and half-fill the Petri dish with the hot mixture. Only take the lid off the Petri dish when you are ready to pour your agar to prevent bacteria contamination.

**6** Immediately put the lid back on the Petri dish and put it in the fridge for about 4 hours until the mixture has set.



## First, Collect Some Bacteria...

Bacteria can be found in almost everywhere and even in places you wouldn't expect! We encourage you to use all 3 Petri dishes to sample bacteria from different places and observe the results later.

Some ideas on places to sample bacteria from: *The glass screen of your smartphone, door knobs, kitchen top, handrails, bathroom sink ...etc.*

**1** Use the cotton swabs and collecting vials in the box to sample your bacteria. Do not take out the cotton swab from the plastic bag until you are ready to use it and avoid touching the cotton heads directly with your fingers.

**2** Use your cotton swab to gently rub on the surface in a zigzag pattern for a few seconds.

**3** Open the lid of the collecting vial and place the cotton swab (with the head going in first) into the vial.

**4** Use a pair of scissors to trim off the excess stem of the cotton swab and close the lid of the vial. Use a permanent pen to label the vial with the location of sample.



## Now Grow Some Bacteria!



Remember to wear gloves and goggles for the following procedure

Now we will transfer the bacteria that we collected onto the Petri dishes and see if we can grow some bacteria colonies! Included in the box are some tracing cards for you to experiment with drawing with the bacteria samples.

If you are up for the challenge, place the Petri dish directly on top of the tracing card and align it with the circle. Use some sticky tape to the tape it down securely (do not tape over the lid as we will take it off later).



**1** Take one Petri dish from the fridge, the mixture should now be solid. Also have your bacteria sample vial ready.

**2** Take the lid off the Petri dish, try not to speak or breath directly onto it as it may contaminate it with the bacteria from your saliva!

**3** Take out the cotton swab from the vial and rub it lightly across the growing agent. The growing agent has a hardness like jelly, so be gentle and avoid scraping the material.

**4** Put the lids back on the Petri dish, and seal the edge with sticky tape. Label the plate with the sample location and date on bottom with a marker.

**5** Place the Petri dish upside down at somewhere warm\*. Avoid direct sunlight or any light completely as the ultraviolet light can kill the bacteria!

**6** Come back in a few days to check the results! Usually it will need 3-5 days for you to see the first colony.

\* Bacteria grows best in a temperature range of 20-45 degrees Celsius. If you are using gelatin as a growing agent, avoid keeping your sample above 25 °C as gelatin will melt.

## Why is it not working?

Sometimes it will need some extra time for the bacteria colony to appear. If you are doing this experiment in the winter it is probably too cold for the bacteria to grow. Place it near somewhere warm-like the back of the fridge, TV or wireless network routers. Never open a sealed petri dish as you might get sick from the bacteria inside! Find a small disposable container and clean the insides with isopropyl alcohol before you start the experiment again.

