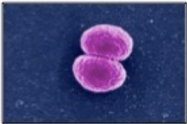
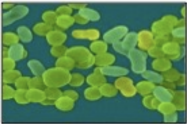
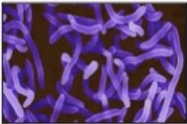
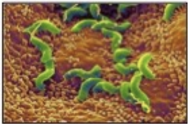
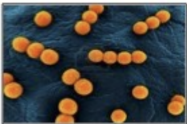



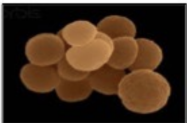


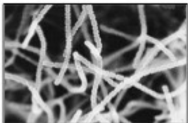


## Let's learn about Microorganisms!

The world is alive with tiny things too small for the human eye to see. In fact, these living things are so small that we call them *microorganisms*. Many microorganisms are made of a single cell, like bacteria. Other types of microorganisms in our environment include fungus and viruses. We will learn a bit more about bacteria.

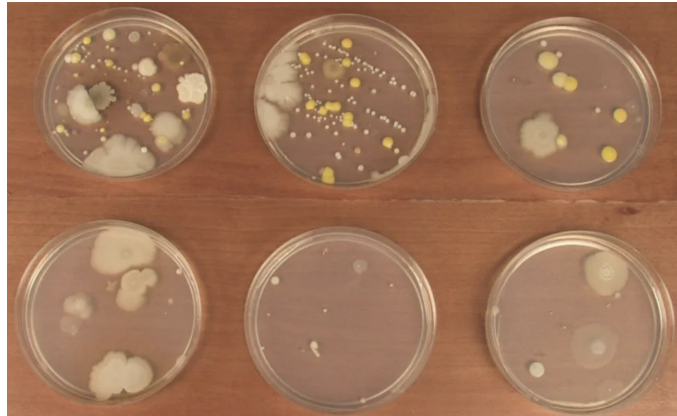
Bacteria are very small cells and are found almost anywhere. You may already know that some bacteria can make you sick. Unlike the bacteria that cause diseases and infections, most of the bacteria inside you right now are harmless and live peacefully side by side with the cells of your body. These bacteria work together with your cells to keep other unwanted invaders away and to help keep your body running smoothly.

Bacteria come in many common shapes and sizes. Some look like spheres. Some bacteria are shaped like rods, called bacilli. Some bacilli are long, skinny rods. Others are short, fat rods (coccobacilli). Other bacteria look like spirals or little corkscrews.

Circular	Rod-shaped	Curved Forms	Other Shapes
 Diplo- (in pairs)	 Coccobacilli (oval)	 Vibrio (curved rod)	 Helicobacter (helical)
 Strepto- (in chains)	 Streptobacilli	 Spirilla (coil)	 Corynebacter (club)
 Staphylo- (clusters)	 Mycobacteria	 Spirochete (spiral)	 Streptomyces

### Other properties of bacteria that are interesting:

- Bacteria are all around and you can grow them pretty easily with some “food” and a warm place.
- Bacteria grow very quickly. If you put 1 bacteria cell on a plate, it will double in number about every 20 minutes!
- While you can't see individual bacteria without the help of a powerful microscope, you can see a colony which is a visible mass of bacteria that grows to form a circular shape. Below are examples of bacterial and fungal colonies of various shapes and sizes.



## Hardy Scientists, let's do some experiments with microorganisms!

### A few safety notes first (Adults: please read carefully):

1. Do not swab samples from bathrooms.
2. Do not lick agar plates or put them near your face.
3. Dispose of all used cotton swabs in the trash after swabbing.
4. Do not touch the surface of an agar plate after you swab it. You are introducing microorganisms to the plate at that point and you want to keep those contained on the plate. You can seal plates with tape after swabbing.
5. Do not open an already swabbed agar plate **unless there is an adult present**.
6. Wash your hands with soap and water after any swabbing and handling of agar plates.
7. Dispose all plates in the trash 5 days after swabbing them.

### How to swab agar plates:

1. Select a surface that you would like to collect samples from (suggestions below).
2. Take 1 of your cotton swabs, remove it from the plastic wrapper, trying to avoid touching the tips while you do so.
3. Dip the tip of the clean swab in the bottle of clean drinking water provided.
4. Swab the surface of choice by rubbing the cotton tip of the swab on the surface a few times. Example: If you choose to swab a leaf of a plant, you can rub the cotton swab on the leaf a few times.
5. Take the cover off of 1 plate and place on a clean surface.
6. Take the swab and **very gently** rub the cotton tip on the surface of your agar plate in zig zag strokes.
7. Place the cover back on the plate and place in a warm (but not hot) part of your home.



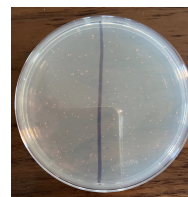
## Suggestions for places/things to swab using the swabbing method described above:

- Use a clean swab to swab the inside of your cheek.
- Use a clean swab to swab your parents cell phone surface.
- Use a clean swab to swab the surface of a leaf of a plant.
- Use a clean swab to swab your hands before and after handwashing.
- Use a clean swab to swab a door handle.
- What else might **YOU** think of?

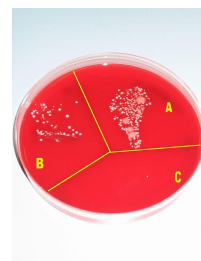
## Suggestions for experiments you can do with your plates:

**HARDY SCIENTISTS:** Check on your plates for 4 consecutive days and make observations about what you see. Are there differences? How many visible colonies can you count on each side? **Take a picture and share your scientific findings at the Hardy Science Fair on Feb 27th or send to Alham Saadat ([alhams999@gmail.com](mailto:alhams999@gmail.com)) or Doris Pfaffinger ([do.77.ris@gmail.com](mailto:do.77.ris@gmail.com)) before Feb 25th**

1. Take 1 of your plates and draw a line down the middle of the bottom half (not the cap side) of the plate with a marker. On one side of the plate, swab (using method described above) one of the items suggested below and leave the other side untouched. Label each side with what you swabbed with.



2. Take 1 of your plates and draw lines on the bottom (not the cap side) to divide the area into 3 equal sized parts. In 1 section, you can swab your hands after a few hours of play/before handwashing (using method described above). On the second section, wash hands with soap and then swab your hands (using method described above). On the third section, use hand sanitizer on your just washed hands then swab your hands (using the method described above) with the second side of the same swab. Label each side with what you swabbed with.



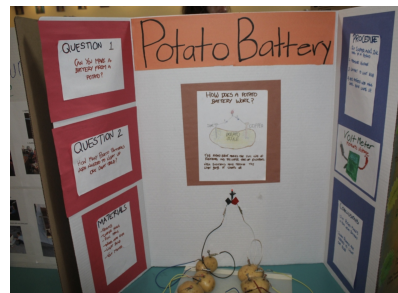
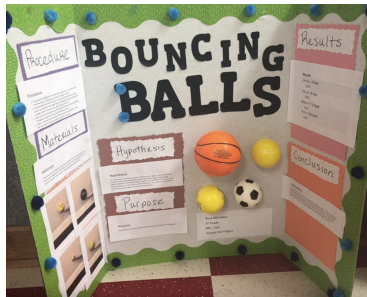
3. Take 1 of your plates and draw a line down the middle of the bottom half (not the cap side) of the plate with a marker. On both sides of the plate surface, swab (using method described above) one of the items suggested below. After swabbing, add a few drops of hand sanitizer to just one side of the plate and spread using the second side of the same cotton swab. Label each side with what you swabbed with.

4. Take 2 of your plates and swab them in the exact same way (using the method described above and swabbing the same surface). Place one plate in a warm part of your house and one in a cold part of your house. Label each plate with cold or warm. Check on plates on four consecutive days and make observations about what you see.

## Suggestions for how to turn this exercise into a project using the scientific method and present it at the Hardy Science Fair on Feb 27th!

While the exercise of swabbing different surfaces and transferring those microorganisms onto an agar plate can be a fun way to learn about the smallest forms of life, you can also use the kit to apply the scientific method to develop a project. The steps for applying the scientific method are as following:

1. Ask a **question**
2. Make some predictions (**develop a hypothesis**) about what you think might happen
3. Carry out some tests (**experiments**) to answer the question
4. Make **observations** of what you see in your experiment
5. Use what you learned from your experiments to answer your question (**conclusions**)



Websites to help you make a great poster:

<https://www.weareteachers.com/free-scientific-method-posters/>

<https://kidsactivitiesblog.com/130376/step-by-step-guide-for-making-a-great-science-fair-poster/>

Hardy scientist adults can also help answer poster questions.....reach out to Alham Saadat ([alhams999@gmail.com](mailto:alhams999@gmail.com)) or Doris Pfaffinger ([do.77.ris@gmail.com](mailto:do.77.ris@gmail.com)) to get connected!