



Microbiology and Viruses

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BACKGROUND:

Microbiology is the study of viruses, bacteria, and fungi. These days, we have become more interested in how microbes spread than ever before, because what we learn is relevant to what is going on in our lives as we learn to live, work, and learn in the presence of COVID-19.

There are many kinds of bacteria and viruses. Some bacteria can make us sick. For example, bacteria cause strep throat. Others can cause food poisoning. But not all bacteria are bad. For example, there are good bacteria in places like soil, food, and in our bodies. Bacteria are everywhere. Learn more at <https://www.ducksters.com/science/bacteria.php>

Viruses are a different type of microbe. They cause many illnesses, including like the common cold and the flu. One type of virus known as corona virus causes the COVID-19.

Working with viruses is difficult. In this experiment, we will see an example of how microbes like bacteria and fungi grow and spread, and we will discover under what circumstances they spread with the most success. This knowledge can help you prevent the spread of all kinds of bad microbes, including viruses.

TO DO THIS MICROBIOLOGY EXPERIMENT, YOU WILL NEED TO PREPARE THE FOLLOWING SUPPLIES. MANY GROCERY STORES WILL BE PLEASED TO DONATE THE BREAD AND THE BAGGIES TO YOUR CLASSROOM IF NEEDED. CALL AND ASK FOR A MANAGER.

YOUR CLASS WILL DO THIS EXPERIMENT IN TEAMS, teams of at least 5 or 6 students are ideal, depending on the size of your class. It's ok to have larger teams, or even one team.

If you are teaching virtual classes, you can also modify this experiment for students to do at home, with family members in their group.

EACH TEAM will need:

- 6 slices of white sandwich bread, without preservatives (if possible).
- 6 sandwich-sized zip lock baggies.
- 1 quart-sized zip lock.
- A sharpie pen OR six post-it notes and any pen or pencil
- The Instructions, data sheet, and result sheet, which are on the following pages.

OPTIONAL

- 1 pair of disposable plastic gloves (optional, don't worry if you don't have any. You can also substitute a clean sandwich baggie, or just be very careful.)
- Hand sanitizer - (if you don't have any, you can skip this part of the experiment)

EACH STUDENT will need:

- One clean paper towel

PREPARE THE SUPPLIES:

VERY THOROUGHLY wash your hands before handling the zip-lock bags or the bread, or wear sterile disposable gloves. Place 6 slices of bread a quart-sized zip lock - one for each team, touching it as little as possible. Then place all this in a refrigerator, until you are ready to start. Place the rest of the supplies for each team in another bag, or hand them out to the team leader with sterile gloves or very clean hands.

It's best not to start this experiment first thing in the morning, when everyone's hands are cleanest.

We will see how well microbes spread from hands that have been unwashed, cleaned with hand sanitizer, and washed for 30 seconds with warm water. We will also see how well they spread from surfaces that we often touch, like cell phones and keyboards. Take a guess.

Which of these four surfaces do you think is most likely to enable spreading microbes? Which do you think is the least likely? (Your guesses are your hypothesis for this experiment.)

DEFINITION:

In science, a hypothesis is an idea or explanation that you test through study and experimentation. It is more than a wild guess, but the idea has not yet been proven true.

This page provides instructions for the experiment that you're about to do. Form a team 4 or 5 classmates. Your teacher can be on a team with your class. Smaller teams are ok, larger teams are better.

FIRST read and understand all of the instructions. In any science experiment it's important to understand exactly how you will conduct the experiment before beginning the experiment. Have your supplies ready. Fill out the data sheet included with these instructions. (Do not yet fill out the results!) Do not yet open the sandwich bag containing bread. Follow the instructions, step by step.

IMPORTANT: TRY NOT TO START THIS EXPERIMENT WITH WASHED HANDS!

You can either designate a team leader, or have each student lead the team for a different step.

STEP 1

If you are using post-it notes, carefully label them as follows in clear handwriting:

KEYBOARD OR PHONE

UNWASHED

SANITIZER

WASHED

UNTOUCHED

Attach 1 note to each of the empty, clear sandwich bags. Or use a sharpie to write the labels directly on the bag. (You will have one bag and one post-it-note left.)

STEP 2

Carefully open the bag that contains the SLICES of bread. Remove 1 slice without touching the other slices. Wipe it once across the cell phone (the side you use) or computer keyboard of each team member. Place it in the bag labeled COMPUTER OR PHONE and seal the bag. Circle the word laptop or keyboard on the label to show which you have used. If you use both, circle both.

STEP 3

IF ANYONE HAS RECENTLY WASHED THEIR HANDS, ask them to FIRST touch the chair they are sitting on and the desk they are sitting at, and a few other surfaces that they might randomly touch in your classroom – door knobs, books, the floor, etc. Or you may have normal unclean hands or hands that have returned from a public place. Carefully remove the next slice of bread. Ask each team member to gently wipe their hands, one time, across the slice of bread. Place it in the bag labeled UNWASHED and seal the bag.

STEP 4

Remove the third slice of bread from this bag. Ask each team member to use hand sanitizer to clean their hands, and then gently wipe their hands across the slice of bread. Place it in the bag labeled SANITIZER and seal the bag. (If you don't have any hand sanitizer, skip this step.)

STEP 5

Take the next slice, and wipe it on a surface chosen by your team. Choose something that you think might have bacteria from daily use. Suggestion – doorknobs, dollar bills, etc. Choose only 1 type of surface, and wipe the last slice of bread on one or more of those surfaces. (For example, if you choose door knobs, you can wipe it on several door knobs, but not on anything else. Put the bread back in the last bag, seal it, and label it with the last post-it note or with your sharpie pen.

STEP 6

Carefully put on the gloves, trying to touch as little as possible of the outside of the gloves, other than the top edges. Carefully remove the next slice of bread, touching the bread as little as possible. (If you don't have gloves, you can try to use the inside of the bag to pick up the bread.) Place it in the bag labeled UNTOUCHED and seal the bag.

STEP 7

Remove the gloves. Everyone in your group must now touch their chair, the table, and other random surfaces around the house – door knobs, faucets, etc. Then everyone must wash their hands with warm water and soap, for 30 seconds and dry their hands with a clean paper towel. IF YOU PREFER: if you are going somewhere, for example, to the playground or lunch, you can do this step after returning. This should be done on the same day as the other steps, but it doesn't need to be immediately after step 6. After washing their hands and drying them, no one may not touch anything else, until you complete this step. Take the remaining slice of bread. Have each group member gently wipe their hands across that slice of bread. Place it in the bag labeled WASHED and seal the bag.

STEP 8

If you have not yet filled out your data sheet, fill it out now.

STEP 9

Lay all your bags of bread in a row, in order, label side up, in a safe place. If you wish, take a fun photo of your class. Send the photo to uschwuttke@ihmc.us. and IHMC will post it on our website. Leave your bagged bread in a safe place where you will be able to look at it daily.

STEP 10

Observe the bread daily, but DO NOT OPEN THE BAGS. Opening the bags may cause mold spores that may be developing on the bread to get out. You don't want that.

After four days, what do you see??? Update your results sheet. Remember not to open the bags!

STEP 11

After six days, what do you see??? Update your results sheet. Remember not to open the bags!

STEP 12

After eight days, what do you see??? Update your results sheet. Remember not to open the bags!

STEP 13 (OPTIONAL)

After ten days, what do you see??? Update your results sheet. Remember not to open the bags!

When you are finished with the experiment, throw away your bread bags without opening them. It can make some people sick to inhale the spores from some kinds of mold – you don't want to release the spores.

LEARN MORE:

About bacteria: <https://www.youtube.com/watch?v=MaAmNE9oesA>

About viruses: <https://www.youtube.com/watch?v=YS7vsBgWszI>

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DATA SHEET

Name of group participants _____

Number of people in group _____

Average daytime temperature of classroom (ok to guess) _____

Average nighttime temperature of classroom (ok to guess) _____

Are you using gloves? ☐ Yes ☐ No

Brand of bread you are using _____

Kind of bread you are using _____

Brand of hand sanitizer (if you don't have any, say NONE) _____

Type of dirty hands (Home, Classroom, Other) _____

HYPOTHESIS

On which slice of bread will bacteria grow the most? Why? _____

On which slice of bread will bacteria grow the least? Why? _____

RESULTS

What do you observe AFTER 4 DAYS _____

What do you observe AFTER 6 DAYS _____

What do you observe AFTER 8 DAYS _____

What do you observe AFTER 10 DAYS _____

On which slice of bread does it look like bacteria grew the most? _____

On which slice of bread does it look like bacteria grew the least? _____

Any surprises? _____

What did you learn? _____

What would you do to improve this experiment if you were going to do it again? _____
