WATER SICKNESS AND PREVENTION

MODULE 3

WATER CONTAMINATION

WHERE CAN YOU FIND WATER?

Where does your water come from?

- You can get water from your home, school, wells, streams, rain, lakes, and more!

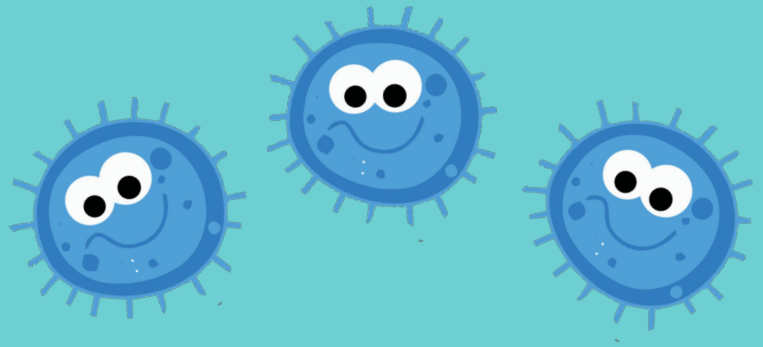
Let's talk about it: Where do you get your water?

- Water can come from many sources, but not all water is clean...

BACTERIA AND YOUR HEALTH

What are bacteria?

- Bacteria, also called germs, are tiny organisms that live everywhere–both inside and outside of your body!
- Some bacteria are good for you, but some bacteria are bad and can make you sick.
- You'll get to learn more about bacteria later!



Fun Fact: Did you know that bacteria has been on the planet for more than **3.5 billion** years? Bacteria are one of the oldest known life-forms on Earth!

CAN WATER MAKE YOU SICK?

Drinking dirty water can make you feel sick

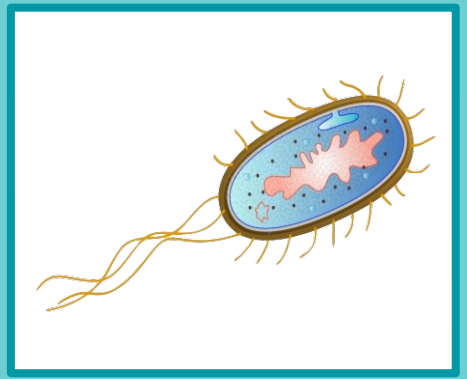
- Watch out! Not all water is clean
- Dirty water can contain bad bacteria and other contaminants like leaves, dirt, chemicals, and more!
- Drinking clean water is important to staying healthy

Let's talk about it:
Can you think of other possible water contaminants?

WATER CONTAMINANT: BACTERIA

What else can contaminate water?

- Think back to what you learned in Module I...
- In addition to chemical contaminants (like arsenic and lead), bacteria can also contaminate water!
- *E. coli* is one kind of bad bacteria that can be found in dirty water
  - The LATAM Intelligent Filter can filter our these three contaminants!



E. COLI

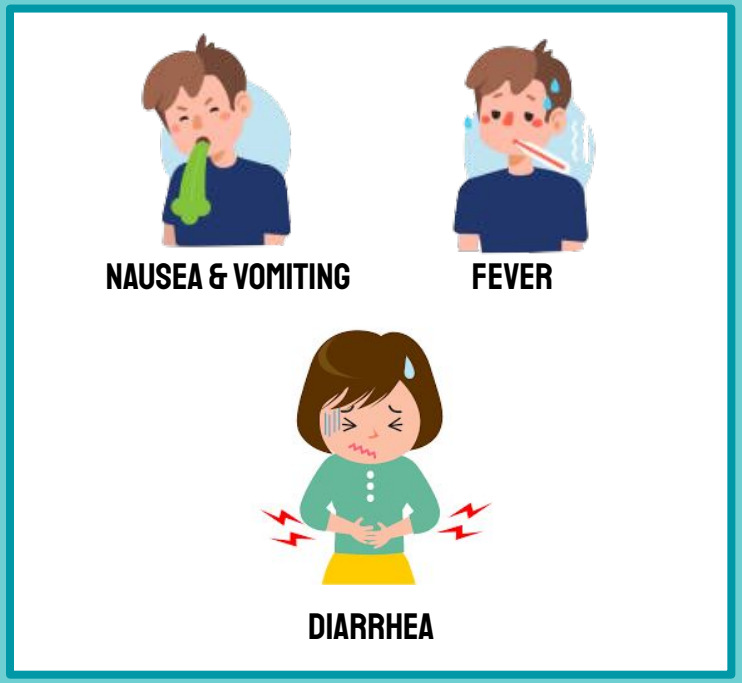
Let's talk about it: Are arsenic, lead, and *E. coli* chemical or bacteria contaminants?

DIRTY WATER AND SICKNESS

How do you know if you're sick?

- If you feel nauseous, have a fever, have diarrhea, or are vomiting (throwing up), you might be sick with a waterborne illness!
- If you feel any of these symptoms, make sure to tell an adult!

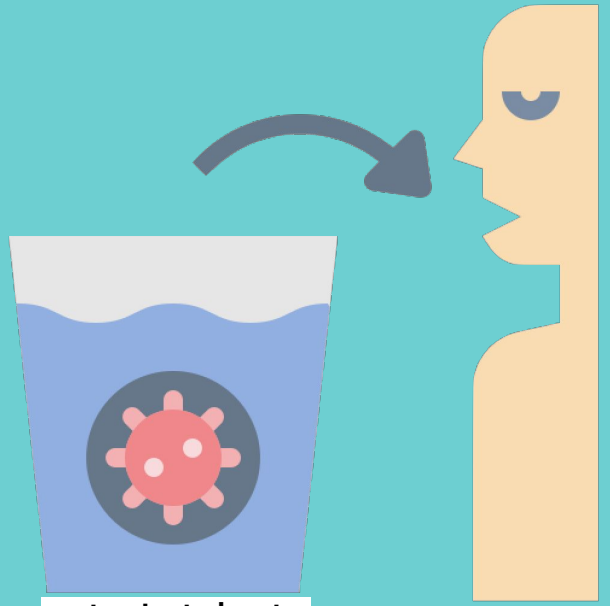
A waterborne illness is a sickness that is from drinking contaminated water!



HOW DOES WATERBORNE SICKNESS SPREAD?

How is sickness transmitted?

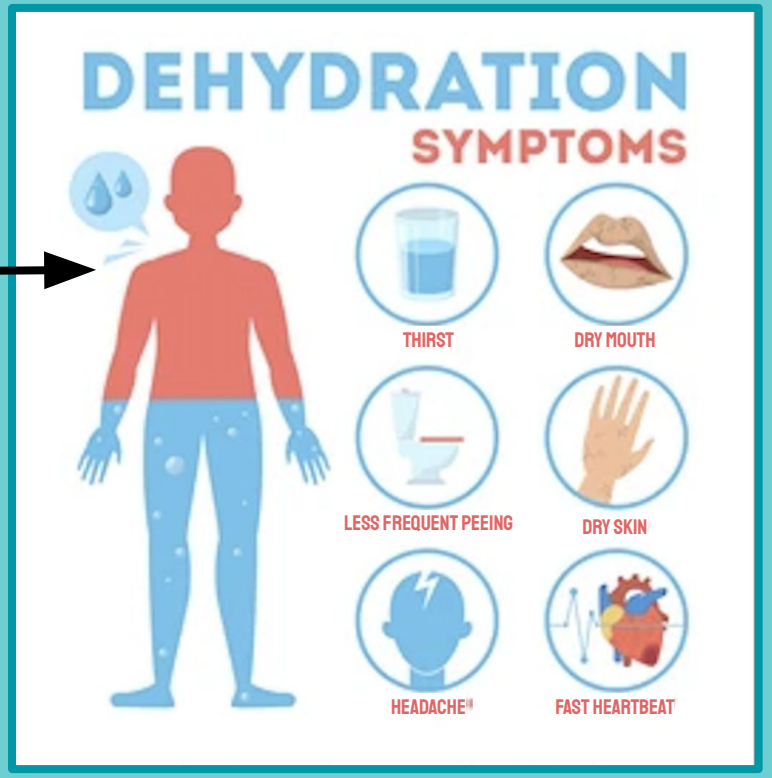
- You can pass on, or transmit, bad germs to others through:
  - **Ingestion**: Drinking contaminated water or eating contaminated fruits and vegetables
  - **Touch**: Getting your hands dirty with bacteria and then touching your mouth, nose, or eyes
- Later in this module, you will learn how you can prevent transmission and stay healthy!



SICKNESS: DEHYDRATION

What is dehydration?

- Dehydration is when you do not have enough fluids, like water, in your body
- When you are dehydrated, you may:
  - Feel thirsty
  - Have dry skin and a dry mouth
  - Have a headache
  - Have a fast heartbeat
- Dehydration can be serious because your body does not have enough fluid to function properly



SICKNESS: DIARRHEA

What is diarrhea?

- Diarrhea is a very common sickness caused by bad bacteria in your digestive system
- When you have diarrhea, you might have loose and watery poop, stomach pain, and cramps
- Watch out! Diarrhea can lead to dehydration because your body loses a lot of water through defecation

PREVENTING DEHYDRATION AND DIARRHEA

How can you treat diarrhea and vomiting?

- Drink water to **stay hydrated**!
- Eat foods that contain salts and sugars
- Get plenty of rest
- You can also check the color of your pee, like you did in Module 2, to see if you are drinking enough water!

Remember this chart from Module II?

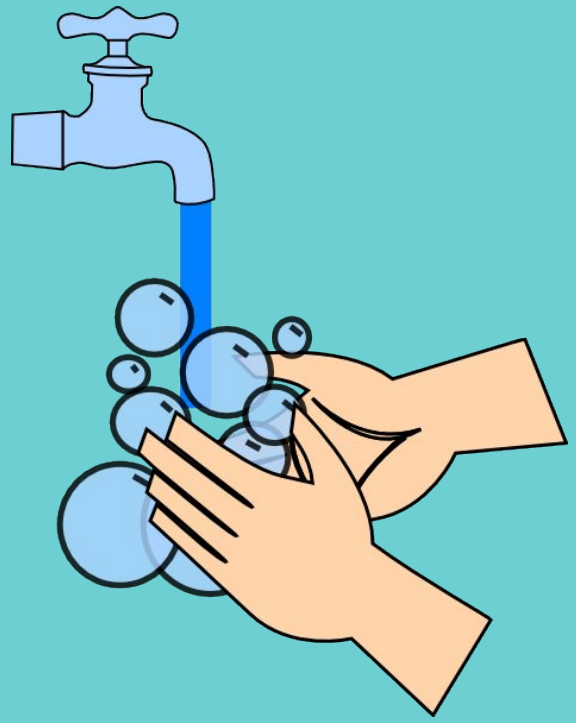
WASH: WATER, SANITATION, AND HYGIENE

WHAT DOES WASH STAND FOR?

The acronym WASH stands for...

- **Water**
- **Sanitation**
- **and**
- **Hygiene**

WASH stresses the importance of having **good hygiene practices** that keep us from getting sick!



GOOD HYGIENE HABITS

- Hygiene refers to the **living habits** that help us stay clean and healthy!
- Next, let's talk about how we can maintain good hygiene!

Let's talk about it: Can you think of any good hygiene habits that might prevent you from getting sick? Think of one example and share it with your friend!

WASHING OUR HANDS!

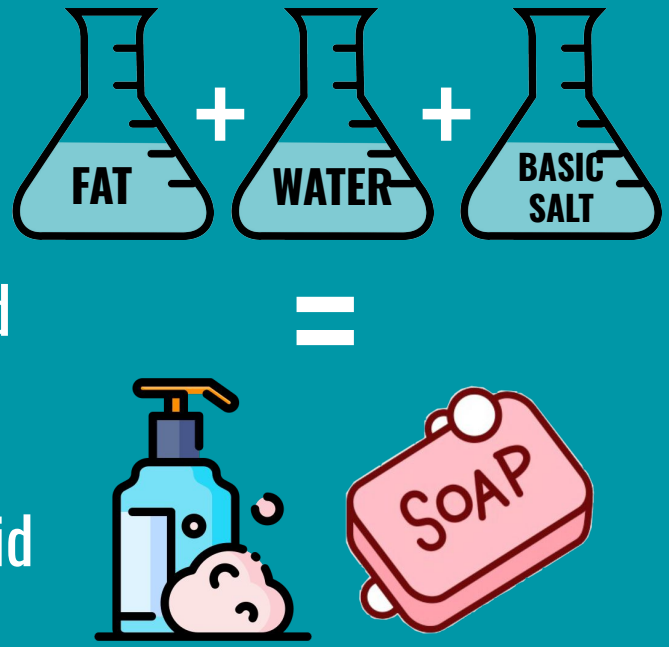
- As simple as it may sound, **<u>washing our hands with soap</u>** is SO important!
- It keeps our hands clean from little, invisible bacteria that can make us sick.
- Washing our hands regularly also helps to prevent the spread of germs to our friends and family!

WHY DO WE USE SOAP?

- Soap acts as our **first line of defense** against harmful bacteria that can make us sick!
- It works together with water to keep our hands germ-free!
- But before we figure out how soap works we need to know what it's made of!

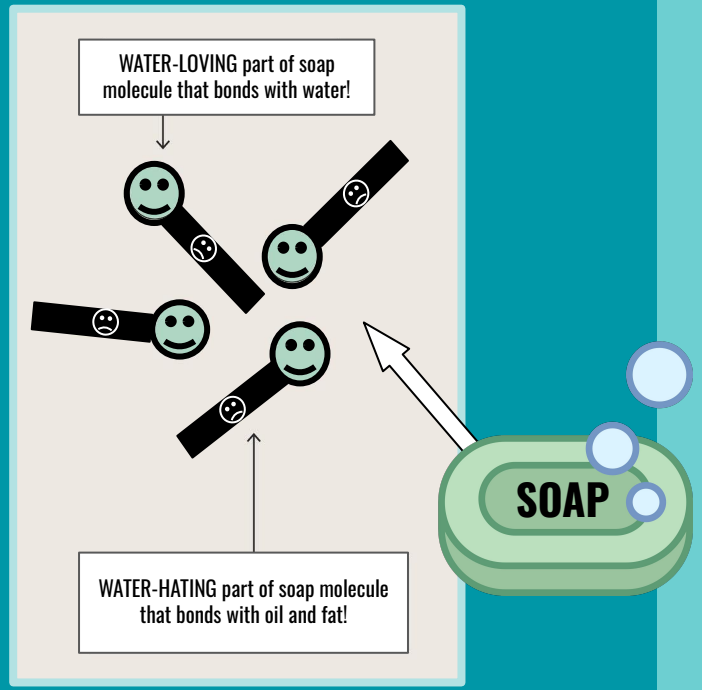
WHAT IS SOAP MADE OF?

- Soap is composed of fat, water and an alkali, or a basic salt
  - When these three parts combine under proper conditions, they undergo a chemical process called **saponification** which creates SOAP!
- Also, the soap produced can be in a solid form or a liquid form!



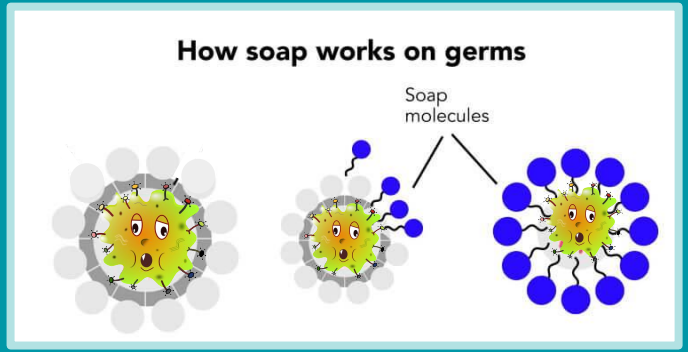
SOAP IS A SURFACTANT

- Soap is also composed of little soap molecules called **surfactants!**
  - One end of the soap molecule is **WATER-LOVING (or hydrophilic)** and bonds with water
  - The other other end is **WATER-HATING (or hydrophobic)** and bonds with fats & oils instead of water
- This fact will play an important role when figuring out how soap actually gets rid of bacteria on our hands!

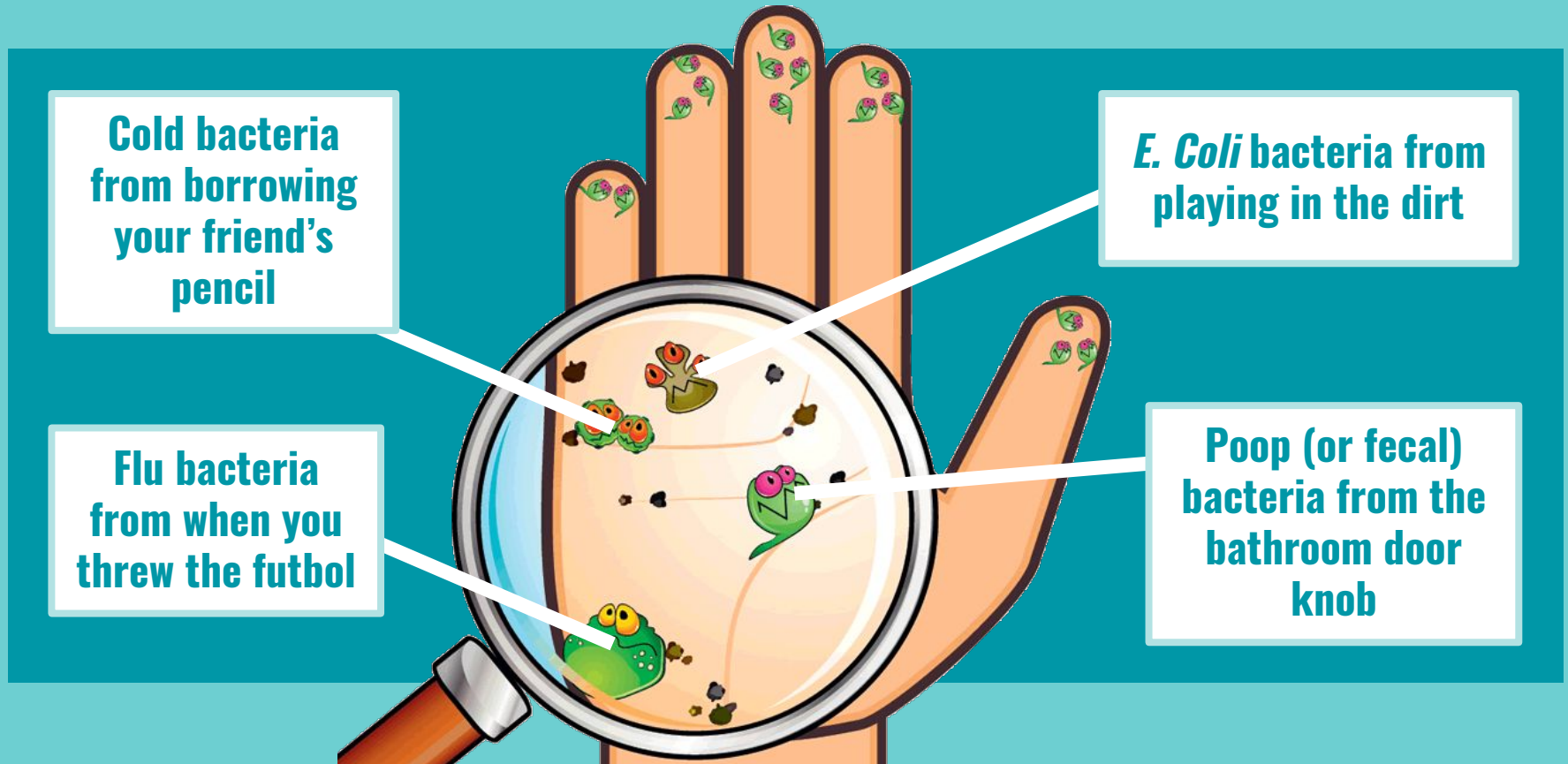


SOAP REMOVES GERMS

- Germs, or bad bacteria stick to the yucky oils and grease on our hands!
- However, water alone is not able to remove bacteria since water and oil don't mix!
- Since soap is both water-loving AND water-hating/oil-loving, it can bind to **BOTH** the water and oil molecules at the same time!
- Then when we rinse off our hands with water, the soap carries the bacteria away with the water!



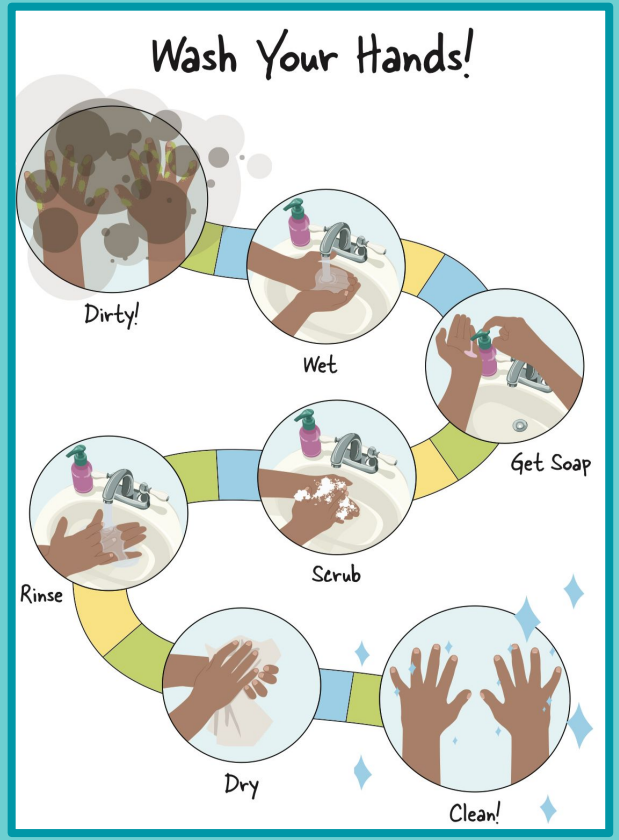
TO BE HONEST, HANDS ARE GROSS



HOW DO WE WASH OUR HANDS?

Handwashing Checklist:

1. Wet your hands with warm water
2. Apply soap
3. Scrub!
   Tip: you should be able to see bubbles and suds!
4. Continue to scrub! We need to scrub for at least 20 seconds to get rid of the germs and bacteria!
   Tip: Keep track of the time by singing the "happy birthday" song twice!
5. Rinse! Make sure all the bubbles on your hands come off!
6. Dry off hands. Now we have clean hands!



WHEN SHOULD WE WASH OUR HANDS?

We should wash our hands:

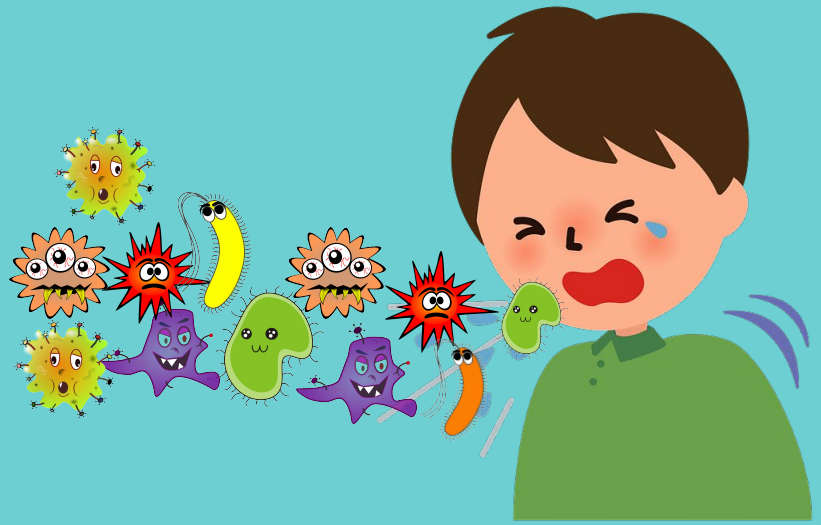
- Before eating
- After using the bathroom
- After sneezing or blowing your nose
- Before caring for friends or family

Let's talk about it: Can you think of other times when we should wash our hands?

COVERING OUR COUGHS AND SNEEZES!

- To avoid spreading our germs and getting others sick, we should cover our mouths and noses when we cough or sneeze.
- When we cough or sneeze, droplets filled with germs fly from our mouths and noses.
- Even if we can't see them, they're there!

Fun Fact: The droplets from a sneeze can travel up to **8 meters** (27 feet) away!



HOW TO COVER OUR COUGHS AND SNEEZES

The correct way to sneeze:

- To stop the spread of germs, we should sneeze into our elbow, NOT our hands.
- Our hands touch many different surfaces, objects, and people. If we sneeze into our hands, our germs spread to everything we touch and can easily get others sick.

Important: Always remember to wash your hands after sneezing or coughing!

TAKING CARE OF OUR TEETH

- Regularly brushing and flossing our teeth helps to keep us healthy!
- There is a transparent layer of bacteria that coats our teeth called *plaque*.
- Buildups of plaque create *cavities* which leads to gum disease and teeth deterioration, and even infections that make us sick!

TAKING CARE OF OUR TEETH

How we brush our teeth:

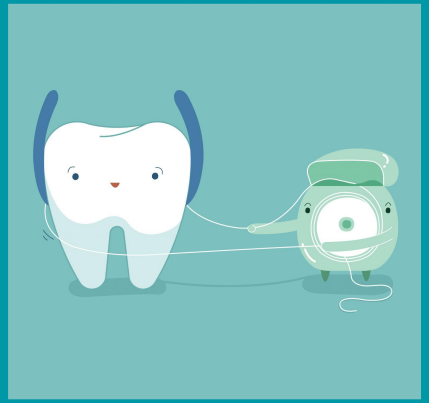
When do we brush our teeth?

- We should brush our teeth once in the morning and once at night.
- In the morning, we get rid of all the bacteria that built up over night!

FLOSSING TEETH!

How we floss our teeth:

- Pull floss string so that it is tight!
- Direct floss in between teeth, making sure to reach your gum!



When do we floss our teeth?

- To keep our gums and teeth healthy, we should floss once a day!

Let's talk about it: Discuss with friends and family how often they brush and floss!

TAKING BATHS!

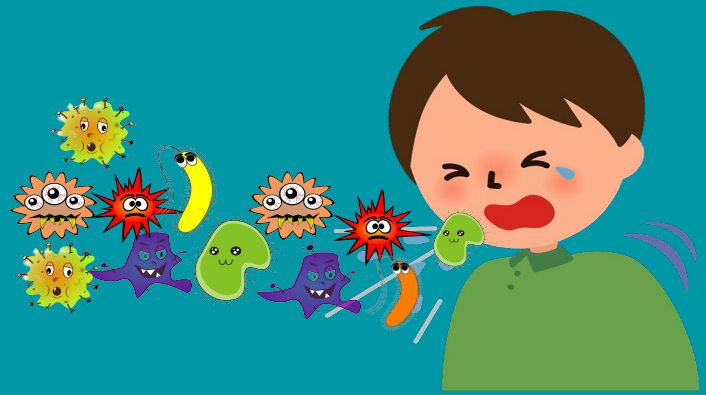
- After running around and playing outside all day, sweat, dust, and dirt accumulate on your skin.
- Taking a bath with soap cleans the germs and bacteria from your skin, and helps keep you healthy!

EXPERIMENT

HOW DOES SNEEZING WORK?

Let's see how sneezing works!

- Remember: When we cough or sneeze, droplets filled with germs fly from our mouths and noses!
- Our germs are made up of bad bacteria that can make our friends and family sick.



Let's talk about it: Can anyone remember how far droplets from a sneeze can travel?

EXPERIMENT

HOW DOES SNEEZING WORK?

Let's see how sneezing works!

- To demonstrate how germs from a sneeze travel through the air, we will use a spray bottle to visualize how far the droplets (germs) travel!

EXPERIMENT
HOW DOES SNEEZING WORK?

Let's experiment!

- Fill a spray bottle with water (if you have access to food coloring, add your favorite color)!
- Find a friend and ask them to stand 1 foot away from you with a blank sheet of paper over their chest.
- Spray the bottle!
- Look at how many "germs" reached your friend!

Just for fun: Ask your friend to move 2, 4, 6, 8, and 10 feet away, then spray the bottle! Make sure to use a new sheet of paper after every spray to see if your "germs" reached your friend!

EXPERIMENTS & ACTIVITIES

HOW CLEAN IS YOUR WATER?

EXPERIMENT

WHICH SURFACE IS THE DIRTIEST?

Germs are everywhere!

- Remember that germs and bacteria can be harmful and they are all around us!
  - Can you name a few places where there might be germs in your classroom right now?
- Since we germs are very tiny, we can't see them very easily
  - But there is a way we can view them!

EXPERIMENT

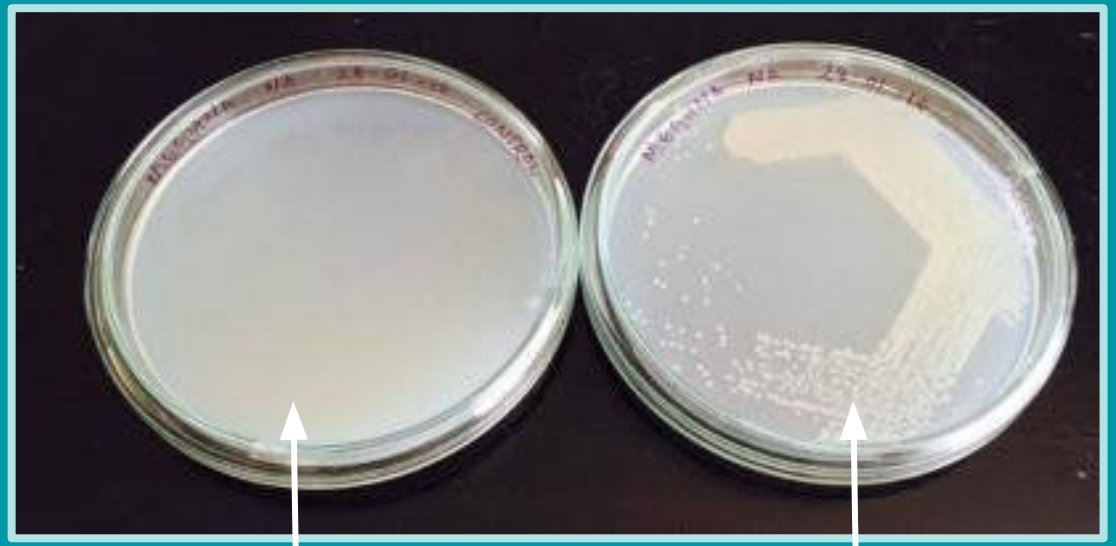
WHICH SURFACE IS THE DIRTIEST?

Germs are everywhere!

- We can take a sample of germs from a surface and let them grow until we can see them!
  - The sample is put on a plate of a jelly-like substance called agar and it looks like this:

EXPERIMENT

WHICH SURFACE IS THE DIRTIEST?



Before bacteria growth

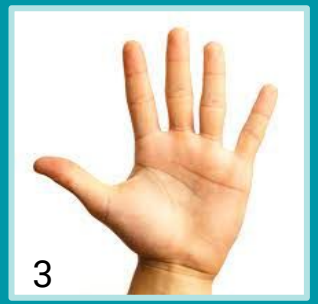
After bacteria growth

EXPERIMENT

WHICH SURFACE IS THE DIRTIEST?

Now, let's experiment!

- Here are four different surfaces:



EXPERIMENT

WHICH SURFACE IS THE DIRTIEST?

Now, let's experiment!

- Which do you think will have the most bacteria? Why?
  - Record your hypothesis on your worksheet
- After you make your prediction, your teacher will show you the bacteria plates from each surface after they grew
  - Record your observations and rank the surfaces in your data table

EXPERIMENT

WHICH SURFACE IS THE DIRTIEST?

Now, let's experiment!

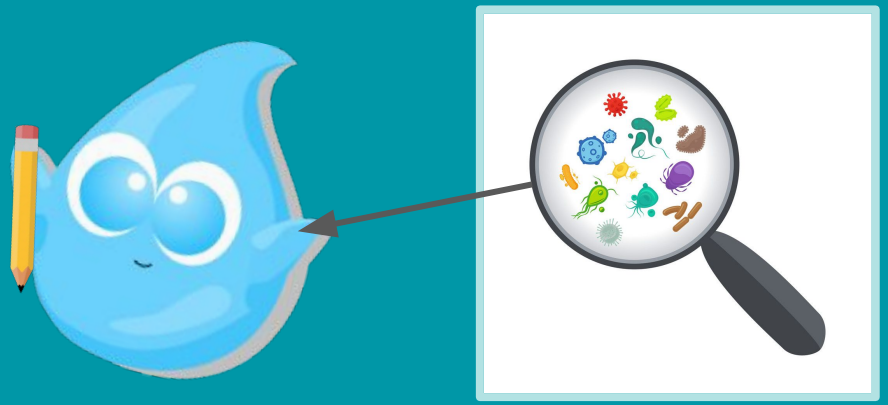
- Which surface was actually the dirtiest?
  - Record your conclusion on your worksheet

EXPERIMENT

HOW DO GERMS SPREAD?

Germs are Dangerous!

- Remember that germs and bacteria can lead to illness and other problems!
  - One place where there are a lot of germs are your hands!



EXPERIMENT

HOW DO GERMS SPREAD?

How do germs spread!

- Some germs spread in the air (like when you cough, sneeze, or talk)
- Others spread through contact (touching)
- Since there are a lot of germs on our hands, let's investigate how many germs spread when we interact with our friends!

QUESTION:

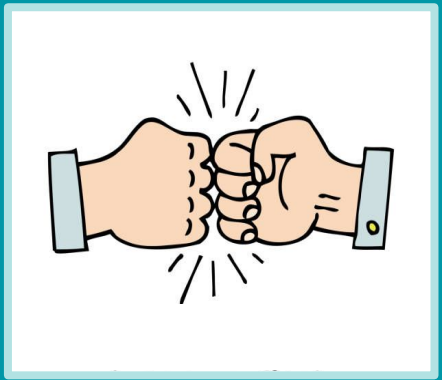
Which method of interacting spreads the most germs?

EXPERIMENT

HOW DO GERMS SPREAD?

Different Interactions

- Here are a few ways that we interact with our friends:



Fist Bump

Handshake

High-five

EXPERIMENT

HOW DO GERMS SPREAD?

How do germs spread!

- Which interaction do you think will spread the most germs?
  - Write your hypothesis on your worksheet

- Now experiment! (your teacher will help)

EXPERIMENT

HOW DO GERMS SPREAD?

How do germs spread!

- Which interaction spread the most germs?
  - Record your conclusion on your worksheet
- Now that you know how germs can spread, you can think about washing your hands after touching dirty surfaces or before touching other people's hands

MODULE III EXPERIMENT-TEACHER GUIDE

MODULE III: EXPERIMENT

WHICH SURFACE IS THE DIRTIEST?

1. HYPOTHESIS: I think the _____ is the dirtiest because _____.

2. EXPERIMENT:

Materials:

- ☐ Tablet with pictures of bacterial plates

Instructions:

1. a

3. DATA:

Surface	Observations:
Bathroom Sink	
Table	
Hands	
Washed hands	

4. CONCLUSION:

The _____ surface was the dirtiest. I know this because _____.

BACKGROUND

- In this experiment, students will explore the cleanliness of different surfaces
  - This should help students understand that there is bacteria/germs present *everywhere* even when they can't see them!
- Ask students to think about where they think bacteria may be in the classroom
  - Desks, chairs, floors, their hands, etc

EXPERIMENTAL OPTIONS

- There are two ways that this experiment can be performed.
  - OPTION 1: If possible, a piece of bread or something similar will be used
  - OPTION 2: If you feel this is inappropriate or do not have those resources, we have provided pictures of bacteria cultures as a substitute!
- If you choose option 1, continue with slides 47 through 51
- If you choose option 2, skip ahead to slides 52 through 59

SET-UP: OPTION 1

- Choose 3-4 surfaces to test for bacteria presence in this experiment (floor, table, chair, toilet, unwashed hands, washed hands, futbol, etc)
  - You might even consider what the students thought of as possible locations for bacteria in the classroom
  - Try to choose surfaces that are commonly touched so that students can learn about how much bacteria is present on those surfaces

HYPOTHESIS: OPTION 1

- Have students hypothesize which surface will be the “dirtiest” (having the most bacteria)
  - Example hypothesis:
  - I think the hand will be the dirtiest because it touches a lot of things.

EXPERIMENT: OPTION 1

- Wipe each surface with a piece of bread (or something similar)
  - Immediately place the bread in a labeled plastic bag and seal it (one that is clear for easy observation). This bag should not be opened again for safety reasons!!
- Leave the bread out for a few days (or until there is noticeable bacteria growth)
- At this point, recollect students and have them recall their hypothesis. Allow students to observe each piece for their data tables (see next slide for example)

DATA TABLE: OPTION 1

- In the data table, have students record observations about each piece of bread and rank the bread from least to most bacteria growth
- Example:

Surface	Observations	Ranking
Bathroom Sink	*Lots of fuzzy spots*	2
Table	*Small black dots*	3
Hands	*Grey fuzzy dots*	1
Washed hands	*Few small white dots*	4

CONCLUSION: OPTION 1

- Based on the bacterial growths, ask students to conclude which surface was actually the dirtiest.
  - Example: The unwashed hand was the dirtiest. I know this because the bacteria plate had the most spots.
- Emphasize to students the importance of hand-washing based on the amount of bacteria on each surface
  - Especially that they should wash their hands after they touch those surfaces and before eating

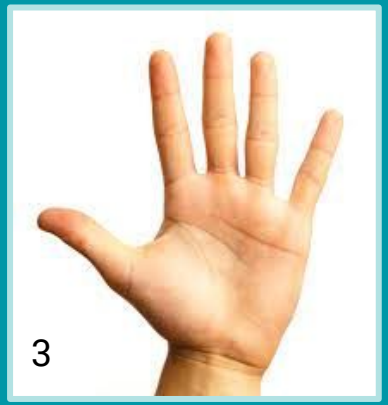
SET-UP: OPTION 2

- Show students the pictures (on the following slides) of the different surfaces (these pictures are also in their workbooks)
  - Describe what each picture is and ask students to hypothesize (on their worksheet) which surface will have the most germs
- Example hypothesis:
  - I think the hand will be the dirtiest because it touches a lot of things.

MODULE III EXPERIMENT I - PICTURES


1


2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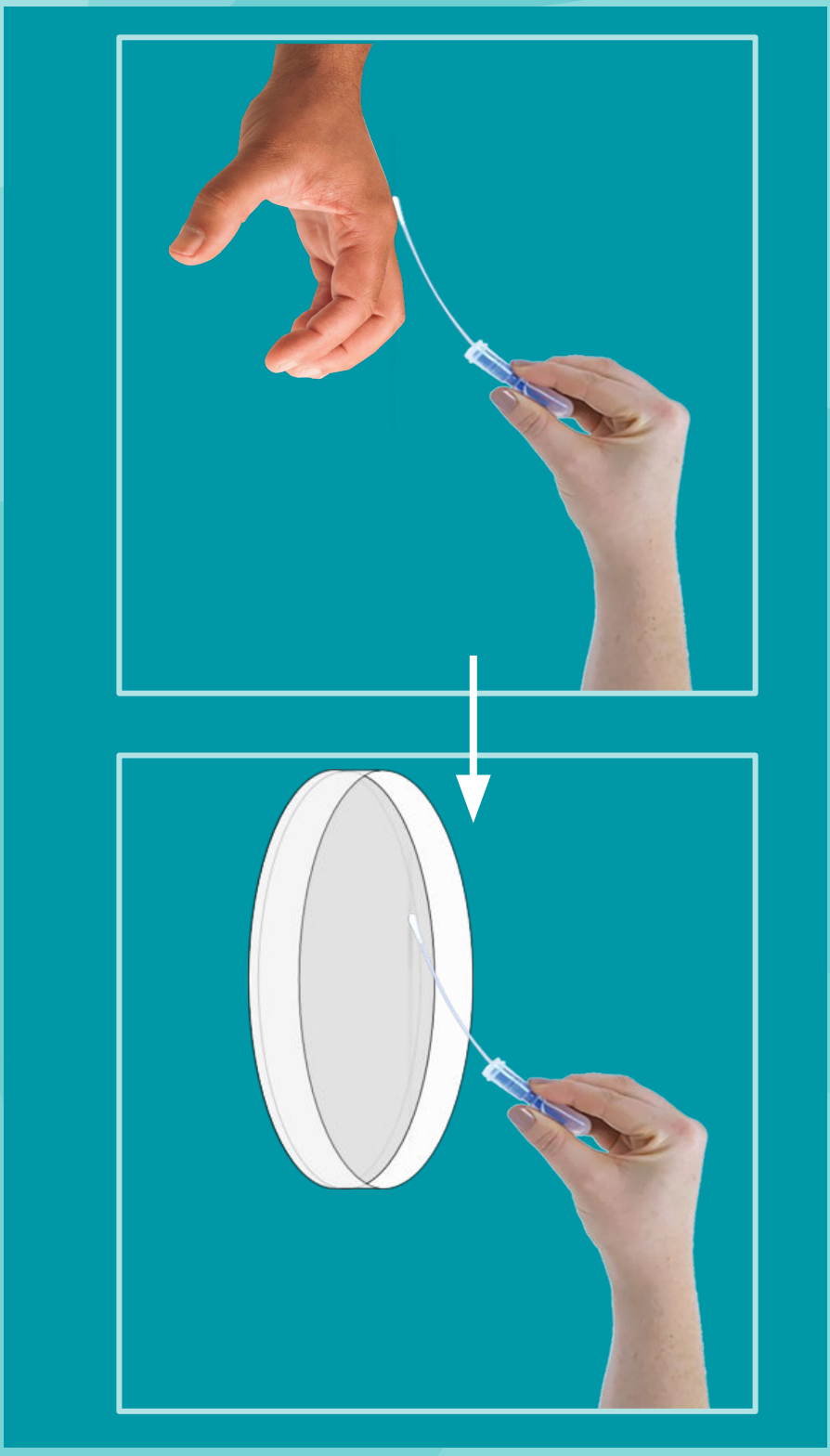
SET-UP: OPTION 2

- Show students the pictures (on the following slides) of the swabbing method used (these pictures are also in their workbooks)
  - Describe that a swab sample of each surface was collected and “plated” on an agar dish.
    - Agar is a gel substance that provides nutrients for bacteria to grow to an amount that we can see

MODULE III EXPERIMENT I - PICTURES



SET-UP: OPTION 2

- This picture (also in the student workbook) shows an example of what an agar plate looks like before and after bacteria growth

Before bacteria growth

After bacteria growth

SET-UP: OPTION 2

- After the set-up, explain to student that the plates were left to grow for a few days
- Then show them the pictures on the next slide (also available in the student workbook)
- Students should use these pictures to fill out their data table

DATA COLLECTION: OPTION 2

- In the data table, have students record observations about the bacteria plates in their data table and rank the plates from least to most bacteria growth
- Example:

Surface	Observations	Ranking
Bathroom Sink	*Lots of yellow specks*	3
Table	*Small white dots*	2
Hands	*Yellow and red dots*	1
Washed hands	*Few small white dots*	4

CONCLUSION: OPTION 2

- Based on the bacterial growths, ask students to conclude which surface was actually the dirtiest.
  - Example: The unwashed hand was the dirtiest. I know this because the bacteria plate had the most spots.
- Emphasize to students the importance of hand-washing based on the amount of bacteria on the washed vs unwashed hands
- Also that they should pay attention to what they touch and how they should wash their hands before eating

MODULE III: EXPERIMENT

HOW DO GERMS SPREAD?

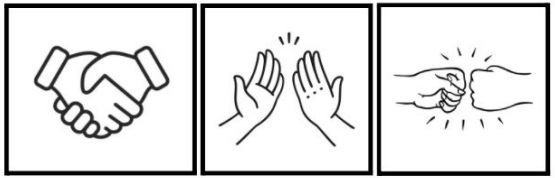
QUESTION: Which type of interaction spreads the most germs?

1. HYPOTHESIS: I think the _____ will spread the most germs because _____.

2. EXPERIMENT:

Instructions:

1. Your teacher will provide you with something to represent "germs" on your hands
2. You will then interact with your friends in different ways to see which way spreads the most germs
3. Record your observations and rank the interactions from most to least germ spread (1 = most, 3 = least)



3. DATA:

Interaction	Observations	Ranking
Handshake		
High-five		
Fist bump		

4. CONCLUSION:

The _____ spread the most germs. I know this because _____.

SET-UP

- Ask students different ways that they interact with each other.
  - Waving, hugging, handshaking, high-five, fist bump, etc.
- Also remind students of the presence of germs on their hands
- Explain that in this experiment we will be exploring how germs spread from hand to hand when we interact with our friends!

HYPOTHESIS

- For this experiment, we will look at fist bumps, high-fives, and handshakes
  - Ask students to hypothesize which will spread the most germs
- Example hypothesis: I think the handshake will spread the most germs because the hands are touching for a long time.

EXPERIMENT

- For this experiment, we will represent germs using something like glitter, flour, or clay
  - Try to find something that will stick to students' hands, transfer to other students hands, and is semi-difficult to wash off
- Students will lightly coat their hands in the "germs"
  - You may choose to pose this as them touching something dirty like the ground or a toilet
  - As a bonus, have students wash their hands and re-try to see how many germs transfer

DATA COLLECTION

- Students will record observations and rank each interaction from most to least germ spread
- Example data table:

Interaction	Observations	Ranking
Handshake	*Lots of spread/transfer*	*1*
High-five	*Germs spread and some fell on to ground*	*2*
Fist bump	*Not a lot of germ spread*	*3*

CONCLUSION

- After the experiment, have students form a conclusion about which interaction lead to the most germ spread
- Example conclusion:
  - The handshake spread the most germs. I know this because I saw more glitter spread to my friends hand.
- Encourage students to revisit their hypothesis
- You may also want to explain to students that this does not mean they should not do any of these, rather that they should keep in mind hand-washing before doing so