

### What are microbes?

**OVERVIEW:** Walk through poster board with pictures of germs and sick people  
Use poster boards to talk about how big microbes are  
Show a “germ” under the microscope (probably aspergillus)  
Use giant microbes to talk about bacteria and viruses

#### DETAILED PLAN:

**Volunteers:** 1-2

**Materials:**

Poster board with pictures of germs and where germs are found  
Posters comparing the size of microbes to salt, grains of rice, etc.  
Microscope  
Microscope slides  
Giant microbes

**Learning Objective:**

Students will be able to describe what “germs” are in the context of bacteria. They will gain an understanding of the size and shape of bacterial cells and their function in everyday life. If age appropriate, they will be able to relate bacterial surface structures to locomotion and virulence.

**Topics to Talk About:**

Compare sizes of bacteria, fungi, and viruses using the poster boards

- See microbes using the microscope

Bacterial shapes (rod, spherical, spiral)

Bacterial appendages (flagella, cilia, etc.)

- In the context of movement
- Giant microbes can help
- In the context of virulence (if the kids are older)

Good vs bad bacteria

**Step by Step Activity:**

Ask students if they know what germs are

Walk through the poster board to look at examples of different germs (mostly bacteria) and use giant microbes to help explain as well

- What do germs look like? (ex. Some have flagella to help them swim, cilia for movement, structures on their surface to help them stick to things, etc.)
- Where are germs found? (ex. In our gut, in the soil, on our skin, in our mouth, in undercooked and raw foods, etc.)
- What do germs do? Good? Bad? (ex. They make people sick, they help make bread, they can help break down food that we eat, etc.)

Explain how big bacteria are using the size comparison poster boards and look at a microbe under the microscope

- Can we see bacteria with our eyes?
- Explain what a microscope does (ex. Makes things look bigger, helps us see very small things)
- Have student explain what they see under the microscope (what does the microbe look like)

## Where are microbes found?

### OVERVIEW:

#### Set this up as an experiment:

Are you ready to be a scientist and find some germs?!?

#### Preparation:

Dust a doorknob, cup, floor, table top, etc. with glogerm powder

#### Experiment:

Put gloves on

Shine UV light on gloves to show they're clean

Touch everything in this area you think might have germs

Shine light on gloves to show they're covered in germs

### DETAILED PLAN:

#### Volunteers: 1-2

#### Materials:

Dusted with glow germ powder:

- water bottle, plastic cup, doorknob (in classroom depending on location), table top, floor – use the setting, if there's a place germs should be found, dust it with glow germ (within reason)

UV light

Dark box (cardboard box)

Gloves

#### Learning Objective:

Students will be able to form a hypothesis about where they think germs are found, test their hypothesis, and form a conclusion about which surfaces/objects had the most germs. Students will be able to describe where germs are found and why more germs are found in some places/on some objects compared to others.

#### Topics to Talk About:

Bacteria are everywhere

Some surfaces/objects are touched by a lot of people

Some surfaces/objects are cleaned frequently to eliminate germs

#### Step by Step Activity:

Get students excited to do an experiment! They just learned all about germs, now let's find some!

Ask students where they think germs might be found

- In the world
- In their house
- In their classroom
- In the station area where the activity is set up

Find germs

- Have students put on gloves
- Look at gloves under UV light in the dark box to show that their gloves do not have germs yet
- Tell them to touch all the surfaces/objects they think have germs (can try to limit this to the area where the activity is set up)
- Look at gloves under UV light in the dark box to show that now their gloves are covered in germs

- **\*\*Can also look at gloves after each object they touch, although this will probably depend on how many students are present at a given time\*\***

Discuss which objects the students think have more germs

- Explain why some objects/surfaces may have a lot (ex. many people touching them)
- Why some objects/surfaces may have very few (ex. Cleaned a lot, antimicrobial surface, etc.)

Shuttle to the next station where they will learn about how we get rid of germs (Keep gloves on!)

## How can we get rid of microbes?

### OVERVIEW:

#### Follow-up on previous activity:

“wash” hands with a wet-wipe to get rid of germs

#### How do we get rid of germs in other places?

Preparation: Dust counter with glogerm powder

Activity:

- Shine UV to see “germs”
- Wipe counter with wet wipe
- Shine light to see germs disappear

### DETAILED PLAN:

**Volunteers:** 1-2

#### Materials:

Gloves (students should have these on from the previous activity)

UV light

Dark box

Wet wipes

Glow germ powder – dust on the table or a hard object in preparation

#### Learning Objective:

Students will be able to describe how we get rid of germs using common cleaning products. Advanced students will be able to describe very basic concepts for how cleaning products work (dehydration, antimicrobial compounds, etc.) Students will also gain a general understanding of why we cook foods to get rid of germs, antibiotics, and why it is so important to get vaccinated.

#### Topics to Talk About:

Which surfaces/objects are cleaned in their house, school, etc.

Cooking food

Washing hands

Vaccines

Antibiotics

#### Step by Step Activity:

Recap: Eww gross! Your hands are all covered in germs! How would you get rid of them?

Have students wash gloved hands with a wet wipe to get rid of the germs they just picked up

- Look at gloves under the UV light in the dark box to see that the germs are gone
- they can take the gloves off after this

Ask students how they get rid of germs at home? At school? What are some ways other than hand washing that we get rid of germs?

Suggest that one way to get rid of germs is using an antibacterial wipe/cleaning spray

- Shine UV light on pre-dusted table/hard object to show students the germs
- Use wet wipe to clean the germs off the table/hard object
- Shine UV light on the cleaned table/hard object to show students that the germs are gone

Compare this to other methods of eliminating germs

- ex. Cooking food, antibiotics, vaccines, etc.
- For older kids, you can go more into detail about how cleaning products work – they cause stress to the bacteria, they dry out the microbe, maybe they have antimicrobial compounds – can also tie in antibiotics and vaccines here to provide a broad understanding of how we battle germs

Suggest that cleaning is an easy way to deal with germs that are already there, but we can prevent the spread of germs too (this leads into the next activity/station)

## How are microbes spread?

### OVERVIEW:

What happens when you're sick? (coughing, sneezing, runny nose) Do you think those things spread germs?

How far do you think a sneeze can go? How far can germs spread?

- Have sheet of paper set up
- Kids spray glogerm at the paper from a distance of their choosing
- Shine light on paper to see if the germs made it

How else do you think germs are spread? (ex. Wiping nose then shaking hands)

What are some ways to stop the spread of germs? (hand washing, cleaning counters – they should know this from the previous activity)

### DETAILED PLAN:

**Volunteers:** 1-2

**Materials:**

Option 1: spray bottle, vinegar solution, index cards

Option 2: glow germ spray with canister, paper/index cards, UV light and dark box

**Learning Objective:**

Students will be able to describe how germs are spread and name ways that we can prevent the spread of germs (ex. Washing hands, covering coughs and sneezes, etc.).

**Topics to Talk About:**

Hand washing

Coughing into your elbow

Sneezing into a tissue or your shirt

Ways that germs are spread (ex. Touching door handles, coughing and germs traveling through the air, sneezing and germs traveling on droplets, etc.)

**Step by Step Activity:**

Recap what they have learned already:

- we know now what germs look like
- they're small
- they're found everywhere and on a lot of things we touch
- we can get rid of them by cleaning and washing our hands

How do you think germs get to all those places?

- They are on a lot of things we touch, so maybe they came from our hands
- How would they get on our hands? Coughing, sneezing, touching something else
- Maybe they can travel on droplets or through the air

When you're sick you have a lot of germs and they can make you cough and sneeze and make your nose run or your throat sore. Coughing and sneezing can spread a lot of germs because they forcefully send the germs out of your body and into the air around you or onto objects around you.

How far do you think a sneeze can go? How far do germs travel on a sneeze?

- MGM volunteer holds the index card
- Student takes the spray bottle/glow germ spray canister and sprays at the index card from a distance of their choosing
- See the vinegar on the card or shine UV light in dark box on the card to see if the germs made it

What are some ways to stop the spread of germs?

- Wash hands
- Cough into elbow
- Sneeze into a tissue or your shirt
- Clean counters and doorknobs

Send to next activity: We just talked about some bad germs and how to get rid of them and stop disease from spreading, but are all germs bad?

**Are all microbes bad?****OVERVIEW:**

Walk through poster board of places to find good microbes  
Give examples of what good microbes do (digestion, yeast and bread, prevent bad microbes from colonizing, plant roots)  
Comparison of how many good microbes there are compared to bad microbes

**DETAILED PLAN:**

**Volunteers:** 1

**Materials:**

Poster board with examples of good microbes and where they are found

**Learning Objective:**

Students will gain a broader understanding of microbes and be able to name some beneficial microbes, where they are found, and what role they play.

**Topics to Talk About:**

Good vs bad microbes  
Digestion  
Bread and yeast

Microbes that colonize plant roots

Microbes that help maintain nitrogen in the environment

**Step by Step Activity:**

Recap: So we just learned about some bad microbes that can make us sick and how we can get rid of those and keep them from spreading, but are all microbes bad? No! Some are really good!

Use the poster board to walk through examples of good microbes and what they do

Point out that actually we have more bacteria than human cells and that there are way more good bacteria than bad bacteria

Send to next activity: But how do we know whether a bacterium is good or bad?

## How do scientists tell whether a microbe is good or bad? How do microbes know what to do? Whether to be good or bad?

**OVERVIEW:**

DNA is what scientists use to identify microbes, it's the instruction manual that tells a microbe what to do, you also have DNA and it tells you to be you

Extract DNA from Strawberries:

Mash up some strawberry in a tube

Add enough soapy water to cover the strawberry

Hold the cap tight and shake the tube really hard

Add a few milliliters of ethanol

Don't shake the tube, let it sit for a minute, see the DNA precipitate

**DETAILED PLAN:**

**Volunteers:** 2-4

**Materials:**

Test tubes

Test tube racks

Ethanol

Soapy water

Strawberries

Transfer pipettes

Preparation: fill tubes with a little bit of strawberry and place in one rack

**Learning Objective:**

Students will be able to explain that DNA is a molecule found in all living things and that it is the instruction book for the cell. They will learn that DNA is found in humans, plants, and microbes.

**Topics to Talk About:**

DNA is what makes you you

DNA is found in all living cells

DNA is an instruction book

Strawberries have a lot of DNA

**Step by Step Activity:**

Recap: You just learned that not all microbes are bad, but how can we tell whether they are good or bad?

- Do you know what DNA is? Based on their answer, explain that DNA is a molecule inside all living cells that is like an instruction book telling the cell what to do.

- Each microbe has an instruction book that tells it to be good or bad, and we can extract this book and look at it to tell what kind of microbe is there
- It's hard to get the instruction book out of microbes because they are small and so you need a lot of them to get a lot of DNA, but strawberries have a LOT of DNA

Let's do an experiment!

- Hand each student a tube with strawberry
- We are going to get the instruction book out of these strawberries!
- First, add some soapy water to break open the cells
  - Add about 2mL soapy water
  - Have them cap the tube and hold the cap on tight
  - Shake really hard to break open all those cells
- Can we see the DNA yet? No! It's dissolved in water
  - A good comparison here is dissolving salt in water or sugar in tea
  - The DNA likes water so we can't see it, but it doesn't like alcohol
- Add 2-3mL of ethanol – DON'T SHAKE THE TUBE THIS TIME
  - The DNA doesn't like alcohol so it precipitates/comes out and we can see it float to the top
  - They can take this whole tube home

Relate back to microbes: So that boogery, goopy stuff is the strawberry DNA that was telling the cells how to be a strawberry – what to look like, what to smell like, what to taste like. DNA in the microbes tells them what to look like, where to go, whether to be good or bad, etc.

Send to next station: Now that you know what microbes look like, where they live, how they spread/get around/travel, and how they know what to do, you can make your own!

## Build your own microbe – Build a Bug!

**OVERVIEW:** Kids can make their own microbe using the supplies provided!

**DETAILED PLAN:** **Volunteers:** 2-3 (try to keep the supplies organized – little kids will spread them to other tables if you aren't careful!)

**Materials:**

Craft supplies including generally: construction paper, crayons, markers, glue sticks, scissors, string, pipe cleaners, googly eyes, pom poms, cotton balls, hole punch, tissue paper, popsicle sticks, paper plates, tape, Styrofoam cups, toothpicks, etc.

**Learning Objective:**

Students will use what they have learned in the previous stations to build their own microbe. Ideally, this provides a fun way for them to apply what they've learned. (Also a great activity for younger siblings who are too young to understand the concept of germs)

**Topics to Talk About:**

What shapes are microbes

What do they use to get around (flagella, cilia, etc.)



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**Step by Step Activity:**

We can make some example microbes or use the giant microbes for this, but for the most part kids should be free to create their own bug

MGM volunteers can help students glue/tape/etc.

Brown paper bags will be offered to carry the microbe, strawberry DNA, and sneeze paper