

## STAGE 1 – DESIRED RESULTS

**Unit Title:** Microbiome

**Grade:** 2<sup>nd</sup> grade

**Time:** 3 days, 45 minutes

**Overview:** This unit consists of 3 lessons, each of which are approximately 45 minutes long. The unit will introduce students to the microbiome. Students will learn about the microbes all around them and on their bodies as well as some of what they do. They will take samples of bacteria on their bodies (head, toes, armpit, belly button, hands), which then will be plated and incubated. Students will observe the colonies from their bodies and record their observations on worksheets, which they will use when sharing their findings and any patterns they noticed with the class. On the last day, students will create an art project that represents a microbe of their choice.

### Learning Goals/Understandings:

#### Common Core State Standards for ELA:

##### [CCSS.ELA-LITERACY.W.2.8](#)

Recall information from experiences or gather information from provided sources to answer a question.

##### [CCSS.ELA-LITERACY.SL.2.1](#)

Participate in collaborative conversations with diverse partners about *grade 2 topics and texts* with peers and adults in small and larger groups.

##### [CCSS.ELA-LITERACY.SL.2.1.A](#)

Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).

##### [CCSS.ELA-LITERACY.SL.2.1.B](#)

Build on others' talk in conversations by linking their comments to the remarks of others.

##### [CCSS.ELA-LITERACY.SL.2.3](#)

Ask and answer questions about what a speaker says in order to clarify comprehension, gather additional information, or deepen understanding of a topic or issue.

#### NYS Elementary Science (K-4) Standards:

5.1a. All living things grow, take in nutrients, breathe, reproduce, and eliminate waste.

5.2g. The health, growth, and development of organisms are affected by environmental conditions such as the availability of food, air, water, space, shelter, heat, and sunlight.

**Next Generation Science Standards (NGSS):**

**Planning and Carrying Out Investigations**

Make observations (firsthand or from media) to collect data which can be used to make comparisons. (2-LS4-1)

**Connections to Nature of Science**

**Scientific Knowledge is Based on Empirical Evidence**

Scientists look for patterns and order when making observations about the world. (2-LS4-1)

**LS4.D: Biodiversity and Humans**

There are many different kinds of living things in any area, and they exist in different places on land and in water. (2-LS4-1)

**Driving Questions:**

What kinds of microbes live on and around us?

- What are their shapes, colors, and textures?
- Where can we find microbes on our bodies?
- How many different kinds of microbes are on our bodies?
- Are there different microbes on different parts of our bodies? From person to person? How many different types?

**Students will know:**

- What microbes and colonies are
- Characteristics of microbes and colonies (there is a diversity in shapes and sizes of microbes, which varies according to location)

**Students will be able to:**

- Ask and answer questions.
- Engage in discussions with peers and teacher.
- Complete observation notes about the different types of colonies and describe characteristics of these colonies.
- Create microbe artwork.

## STAGE 2 – ASSESSMENT EVIDENCE

Students will be formatively assessed based on the following:

- Completed observation worksheet
- Turn and talk discussions
- Whip around responses
- Answers to questions
- Observations

## STAGE 3 – LEARNING PLAN

### Summary of Learning Activities:

#### \*\*\* Day 1: Building Background Information and Microbe Sampling \*\*\* (45 minutes)

#### **Anticipatory Set/Hook:** Introduce students to microscope and microbes. (5 minutes)

1) Show students yeast cells under a microscope from first PPT slide. Engage in a discussion with students about what they see. Some information to include in this discussion:

- These are yeast cells.
- 1 yeast cell (1 circle or oval on PPT slide image) is about 3-4 um wide. About 1000 of them would fit into a grain of rice (show students a grain of rice for a visual, concrete comparison – this can be passed around). In a package of yeast, there are billions of yeast cells (again, a package of baker’s yeast can also be shown to students).
- Yeast is alive, just like plants and animals! Why? Yeast makes wastes, grows, and reproduces (makes more yeast cells).
- Who likes bread/pizza? Yeast is important in making bread or dough. At lunch, look closely at your sandwich bread, and you will see tiny holes that were made by yeast.

\*\*If possible, use a microscope to show students firsthand what yeast looks like under a microscope.

#### **Introduce the Lesson Topic:** (2 minutes)

2) Tell students that they will be learning about microbes during the next few days. Discuss with students what microbes are (tiny living things like yeast cells that we need a microscope to see them).

- Write “microbe” on chart paper/board and draw a picture adjacent to the written word to help students remember it.
- Write “microscope” on chart paper/board and draw a picture to help students remember the term. Underline “micro” and explain that it means “really small.”
- This section of the chart paper/board can serve as an anchor chart for the next few days.

#### **Activate and Build Background Knowledge on Microbes:** (15 minutes)

3) Yeast are not the only microbes. There are many more! Show students pictures of microbes on PPT slide and discuss (some information included in PPT slide notes). Click on paramecium and amoeba pictures to show students videos of these microbes.

4) Show students agar plate with bacterial colonies. Tell students that each cluster is a colony. Write “colony” on the chart/board and draw a picture for students to remember it. Discuss with students how a colony is made up of millions of microbes and that we can see colonies of bacteria with our own eyes. Some potential analogies (use PPT slide images with discussion):

- Airplane view of Delaware Park – It is easier to see a group of trees than just one.
- You drop some crumbs while eating a cookie. Since there are only a few, you do not notice the crumbs. When you sweep them up, though, you are able to see them. Similarly, one ant comes along, but you do not notice it. With more crumbs, more ants come along, and now you have a colony of ants.

5) State how microbes grow and divide to form colonies. Show video on PPT (next slide). Connect back to yeast: under the microscope, it is difficult to see just one yeast cell, but when you have billions of them, as in the baker’s yeast packet, they are much easier to see.

6) Encourage students to turn and talk with a partner, in order to process what they have learned so far. Give them 2 minutes, 1 minute for each partner to share his/her thoughts. Afterwards, call on some students to share their thoughts with the class.

### **Building Background Knowledge on Microbe Communities (8 minutes)**

7) Did you know that microbes live in close contact in communities all around us? Ask students what communities are and connect it to communities of microbes. Tell students that there are communities of microbes all around us, and they can do good work. Discuss some examples (during discussion, show PPT slide with images):

- Microbes in the soil help plants to grow.
- Microbes create natural chemicals that kill insects so that you don't have to spray your crops.
- Microbes help clean the environment. Some microbes actually eat oil and make it less harmful, to help clean up oil spills.

8) Discuss with students microbe communities on humans. Microbes are even closer to us, though. Microbes also form communities in and on our bodies, and we need them to live. But of course we can't see them most of the time.

- Explain to students: We can explore the idea of what the class's different microbiomes (microbes that live on us) look like. How can we figure this out? Again, we can't see the microbes on our skin, but we can take a sample, using a sterile stick that we rub along our skin. Then, we'll run that same stick along a plate with lots of nutrients (food) in it. After a few days, any single microbe that we picked up with the stick will grow into a colony on a plate. Different types of microbes will form different types of colonies.
- Show students pictures of colonies on PPT slide.

### **Taking Microbiome Samples (10 minutes)**

9) Students take samples from themselves using sticks and plates. Help students take samples from their skin, scalp, armpit and another place of their choice such as mouth, belly button, between the toes. Explain that we will bring the plates back to the lab to put in the 37°C incubator, which is approximately normal body temperature. At this temperature, more microbes will grow.

\*\*\*If time permits, students can also take samples from around their classroom or school.

### **Closure (5 minutes)**

10) Recap what students learned and did today. Students can turn and talk and then a whip around where students share their ideas. Pose these questions to students to consider (use PPT slide as visual):

- What do these microbes look like – color, shape, texture (rough/smooth)?
- Are the microbes on one part of my body the same or different from the microbes on another part of my body?
- How are the microbes on our bodies the same or different from the microbes on our friends' bodies?

### **\*\*\*Day 2: Observations of Agar Plates\*\*\* (45 minutes)**

**Anticipatory Set/Hook:** Briefly review previous lesson and introduce today's lesson (5 minutes)

1) Brief recap of the previous day's lesson. Ask students the following questions and encourage students to use vocabulary terms in their discussions (refer to anchor vocabulary chart created the day before):

- Can we see individual microbes without a microscope? (No) This can be a choral response or thumbs up/thumbs down response.
- How can we see microbes without a microscope? (When they divide and grow to form colonies, they become large enough so that we can see them with our own eyes.) This response can be a think-pair-share question.

2) Tell students: Last time we took swabs, and now we're going to look at our plates, to see if we have any colonies!

### **Directions and Conducting Observations: (20 minutes)**

3) Explain to students what they will do in groups. Looking at their plates, they will make observations about what they see, on their own and with their group members. They will record these observations on their observation worksheets, which prompt them to think about the size, shape, color and texture of the colonies that they see.

- Check for student understanding of directions. Depending on students' needs, conduct a think aloud and model how students can fill out the observation worksheets. Give example sentence starters and frames. Show and discuss with students the PPT slide of possible colonies that they might see.

4) While students observe their agar plates and take notes on their observation worksheets, circulate and assist.

**Sharing Observations: (15 minutes)**

5) After most students have completed their observation sheets, ask students to discuss their findings in their groups. Show students the PPT slide of the questions they were previously asked (colors, shapes, textures, same or different depending on body part and from person to person). Call on a student from each group to share responses.

**Closure: (5 minutes)**

6) Explain to students: In fact, our bodies provide many different habitats that suit different types of bacteria. And every person has their own set of microbiomes that is somewhat unique to them. There are microbiome communities that live in our stomach and help us digest our food. They also help fight off bacteria that can make us sick. There are different communities on the dry habitat of our skin and the slightly oily habitat of our scalp. Our armpit forms a nice moist habitat where many microbes can grow. But more different types of microbes grow on the dry skin of our knees. Boys and girls have different microbiome communities. A person's left and right hand can have very different microbes growing on them.

7) Gather the plates together and take images of the class microbiome.

**\*\*\*Day 3: Microbiome Art Project\*\*\***

**Anticipatory Set/Hook:** Briefly review previous lessons and introduce today's lesson **(10 minutes)**

1) Have students look over their observation notes on their worksheets, pick one colony, and draw onto chart paper what they found on their agar plates. Each group of students (about 4) will draw on the same chart paper. In this way, students make a mural of the different types of colonies that they had in their groups, allowing them to visually see similarities and differences. Discuss these murals with the class. Each group can also share their favorite colonies and explain why.

2) So far we've looked at colonies of microbes – we were able to see them with our own eyes. But they look different under a microscope, which lets us see the individual microbe. Let's explore what these look like under the microscope.

- Show students the PPT slide of different microbes and ask students to describe what they see. Talk about how the coccus looks like a circle, spirillum like a spiral, etc. (More detail can be found on the PPT, in the notes section of the slide).

**Art Project: (15 minutes)**

3) Ask each student to imagine their own microbe, perhaps from their favorite colony. They will make their microbe using various art supplies (crayons/colored pencils/markers, pipe cleaners, googly eyes, etc.). The supplies will allow 2-D or 3-D creations. Circulate, assist, and ask students to describe their creations.

**Gallery Walk (5 minutes)**

4) Students participate in a gallery walk around the class to look at their peers' creations.

**Closure (10-15 minutes)**

5) Reconvene as a class and describe what students saw and if they would like to share any comments.

\*\*Students' microbe artwork can be displayed together in the classroom or in the hallway, alongside the images of the plates to create a kind of art installation of the 2nd grade microbiome.

6) Conclude with a turn and talk about what students learned during this unit. Conduct a whip around, where students share what they learned and enjoyed during the lessons.

**Materials:**

- PPT, computer, projector
- Chart paper/board and marker/chalk/whiteboard marker
- Agar plates
- Agar
- Sterile swabs
- Observation worksheets
- Art supplies and paper
- Optional: microscope, rice grain, package of yeast

Microbiome Lab Notes

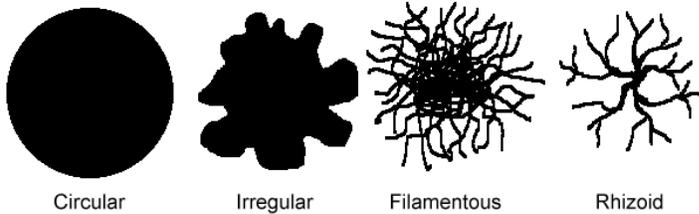
Name: \_\_\_\_\_

A scientist looks carefully at the results of their experiment. These observations are written down in a lab notebook. Sometimes a scientist will draw a sketch of what they see, to keep a record of it.

Remember that each colony starts from a single microbe that has divided MANY times.

Some possible colony shapes:

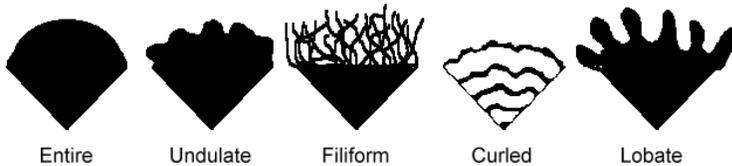
**Form**



**Elevation**



**Margin**



How many different colonies do you have in each sample?

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Do different samples have different types of colonies?

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What do your colonies look like? Draw some of your colonies in the box for each sample. Write some observations about shape, color, texture of your microbiome colonies. Are they shiny, bumpy, slimy, rough? What color are they? Are they round?

SAMPLE #1:

Where was this sample taken? \_\_\_\_\_

Draw some of your colonies.

Describe your colonies.

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SAMPLE #2:

Where was this sample taken? \_\_\_\_\_

Draw some of your colonies.

Describe your colonies.

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SAMPLE #3:

Where was this sample taken? \_\_\_\_\_

Draw some of your colonies.

Describe your colonies.

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SAMPLE #4:

Where was this sample taken? \_\_\_\_\_

Draw some of your colonies.

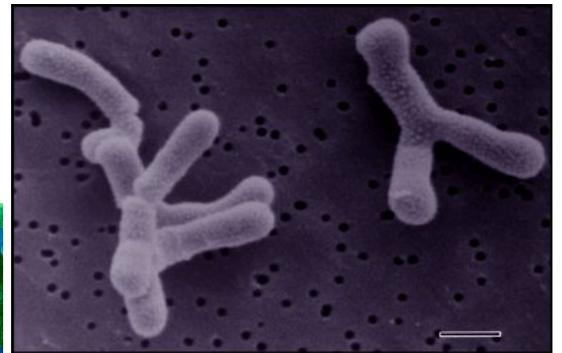
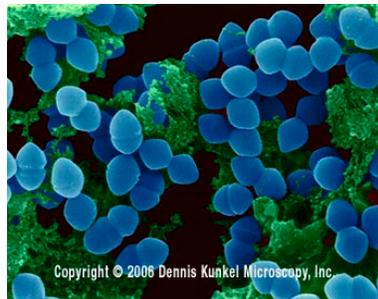
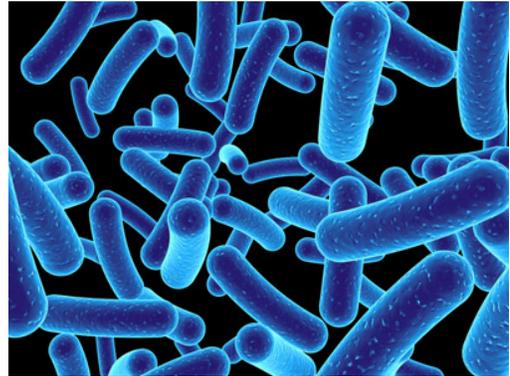
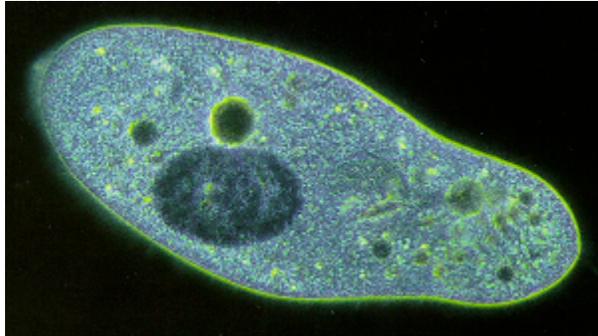
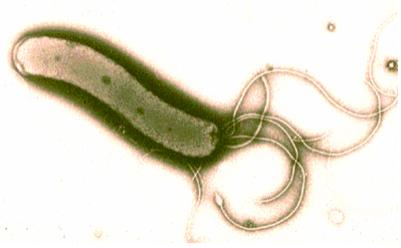
Describe your colonies.

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A few examples of different microbes:



Examples of Bacterial shapes:



# Microbiomes Discovery!

Dear Families,

We will be learning about all of the different tiny microbes that live all around our world and on our bodies and how they help us and our world. using a sterile swab, students will have the opportunity to take their own samples of a microbiome off their own heads and hands to have those individual biomes plated, incubated and developed into a larger colony that each student can then see and create an art project representing their specific biome. We are so excited to be able to have this opportunity and can't wait for it to start!

Please indicate your child's permission to participate in the body biome project. If the permission slip is not returned, your child will create a biome plate from the classroom. Thank you so much for your support with this project!

Sincerely,

Please detach & return to school. Please save the top portion at home.

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\_\_\_\_\_ My child has permission to swab him/herself to create a biome plate.

Student Name: \_\_\_\_\_

Parent Signature: \_\_\_\_\_

Date: \_\_\_\_\_