**Lesson Plan Date Created: 4/20/2023**

**Lesson Plan Date Last Edited:**

**Lesson Plan Date Implemented:**

**Lesson Plan created by: Tinley Hathaway**

**Audience/Grade Level: Middle School students**

**Topic**: Microbiology as it relates to personal health

**Unit:**

**Step 1 Objectives (What do I want my audience/students to be able to do after this lesson?)**:

Students will …

* … be able to describe the importance of keeping their environment and bodies clean
* … be able to distinguish Bacteria, Viruses, and Fungi
* … be able to acknowledge that there are bacteria that are not visible to the human eye and can cause infections/diseases and can also promote good health (probiotics)

**Linked to the following Course Goals/State/National Curriculum Standards:**

* Understand concepts related to human growth and development, health promotion, disease prevention
* Demonstrate the ability to access valid health information, products, and services.
* Demonstrate the ability to advocate for personal, family, and community health.

**Step 2 Assessment Plan (How will I know my audience/students accomplished the objectives?): (direct/indirect) or (formative/summative)**

Direct Assessment:  test, class discussion

Indirect Assessment:  flow charts, diagrams, class participation, hand sanitizer

**Step 3 Activities (How I will help my audience/students achieve the objectives?): (step by step with approx. time of each step and materials needed)**

Day 1: Overview of Microbiology

* Ask kids what they think of when they hear “Microbiology”
* Microbiology:
* Microbiology is the study of tiny-living things called microorganisms. These include bacteria, viruses, and fungi. Microorganisms can live pretty much anywhere, in the dirt, in the water, in our food, even in us!
* Video: [What are microorganisms? Bacteria, Viruses and Fungi](https://youtu.be/9JW63U2mzqo)  (~4min)
* Go over definitions/examples of Bacteria, Viruses, Fungi (~20 minutes)
* Bacteria
* Bacteria are unicellular prokaryotes, that means they have no nucleus and they lack most of the organelles found in the cells of more complex organisms called eukaryotes. Bacteria also only have 1 circular chromosome! They are very small and can only be seen through a microscope (slide includes image of E.coli bacteria). Millions of bacteria can fit on the tip of a pencil!
* Bacteria can come in many shapes:
* Cocci are bacteria that have a spherical, or round, shape.
* Cocci can be arranged in pairs, called diplo-, tetrads, chains called strepto-, or clusters, called Staphylococci.
* The rod-shaped bacilli may exist as individual cells or in pairs, chains, and other groupings.
* Spiral-shaped bacteria include spirilla, which are shaped like coils, and spirochaetes, which have a corkscrew shape and vibrios, which are curved rods that resemble a thick comma.
* Viruses
* Viruses are small pieces of genetic material, like DNA or RNA, surrounded by a protective shell. They can not move on their own, but can spread very quickly through the air, water, or physical contact. Viruses are even smaller than bacterial cells.
* All living cells need to contain genetic material, take in nutrients and reproduce, but Viruses do not take in any nutrients, and can not reproduce, meaning they are not alive! Instead of reproducing, viruses hijack cells and force them to make more copies of the Virus. These hijacked cells are called Host cells, and they can be any kind of cell, human, plant, animal, even bacteria!
* Fungi
* The most commonly known Fungus are mushrooms! But other fungi are actually microorganisms, like mold, mildew and yeast. Fungi can be so small that we can’t see them without a microscope, but some are as big as 60 inches! Fungi are not plants, they do not perform photosynthesis like plants do, instead they get nutrients from dead plant or animal matter. By doing this, fungi are among the organisms that serve as decomposers.
* Many fungi create spores in order to spread. Spores are sort of like seeds that consist of one cell, and then become detached from the parent fungus and start new organisms.
* Activity: <https://www.generationgenius.com/activities/grow-mold-activity-for-kids/> (~15mins)
* Materials
* 2 Slices of bread
* 2 Sealable plastic bags
* Tape
* Marker
* Spray bottle
* Instructions
* Spray 3 squirts of water on each slice of bread.
* Write “COOL” on one bag, and “WARM” on the other.
* Add the pieces of bread to each bag.
* Close the bags and tape the seals airtight.
* Put the bag labeled “COOL” in the fridge.
* Put the bag labeled “WARM” somewhere warm and dark, like a kitchen cupboard.
* Let the bags sit there until the Day 3 lesson then observe!

\*When done, keep the bag sealed and throw it away\*

Day 2: Physical Health

* Recall Activity: Kahoot - <https://create.kahoot.it/my-library/kahoots/drafts>
* Video (~5min) [Immune System - BrainPOP](https://youtu.be/moj9KQ-oizA)
* Pathogens can enter the body in many ways, such as through the mouth or through cuts in the skin. If they multiply sufficiently they can cause an infection. The infection may be caused by the bacteria themselves, or by poisons called toxins that they produce.
* Let's think about COVID-19… (This can be done in pairs or small groups, allow time to share answers with the class after small group discussion)
* What do you remember about COVID-19?
* How did COVID-19 spread?
* Airbourne: coughing, sneezing, being close to people, breathing in their air
* How did we prevent the spread of COVID-19?
* Masks, social distancing, vaccines, etc…
* What are other ways diseases can spread?
* Touch, food, water, animals, insects
* What are other ways we can prevent the spread of disease?
* Wash hands
* Cover mouth and nose when sneezing or coughing
* Vaccines
* Antibiotics
* Social distancing
* Masks

Talk about the immune system (Worksheet)

* Immunology Activity Book Emily Sandvik

Day 3: Gut Health

* Recall: What did we learn about last time?
* We learned about the bacteria that are harmful, now we are going to learn about the helpful bacteria.
* Go over functions of bacteria in the gut (<https://youtu.be/1X8p0vhsWRE>)
* Bacteria that live in the intestines of humans are essential in digesting food.
* Other species play a role in fermentation, a process that produces foods such as yogurt and cheese
* Video: <https://kids.britannica.com/students/assembly/view/171958>

* “There are up to 1,000 species of bacteria in the human gut microbiome, and each of them plays a different role in your body. Most of them are extremely important for your health, while others may cause disease” (6)

* Get out the bread from Day 1 - Activity [Mold Growing Activity WS](https://docs.google.com/document/d/1qJTC6_9gUA1yept4MRZmyFj7ns6IjAzwtCkUg69uN5o/edit?usp=sharing)

\*DO NOT UNSEAL THE BAGS\*

* Students observe both the bread bags labeled warm and the ones labeled cold
* “Like bacteria, fungi are also microbes. Fungi include yeast, mushrooms, and mold. Cold temperatures slow the growth of microbes, which is why we have refrigerators. Things last longer in the fridge because bacteria and fungi grow slower in the cold. This is why the “COOL” bread doesn’t grow mold over a week, while the “WARM” bread does.”

**Materials: worksheets, power point, microscope slides**

**Preparation of Materials/Timeline:**

**References:**

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**After Implemented:**

**Step 4 Observations:**

**Step 5 Notes for improvement:**

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

**Instructions**: Observe the bread bags you labeled the other day. Answer the questions about them. Be sure to keep the bags sealed the entire time.

What do you observe on the bread bags labeled warm vs. the ones labeled cold?

Draw a picture of what the bread in each bag looks like.

Mold is a fungus that feeds off of moisture and organic foods. Why do you think the bread in one bag grew mold and the other did not?

Cold temperatures slow the growth of microbes. How might this be relevant for food safety?