**Small Things can be a Big Deal**

**NATURE Sunday Academy 2020-2021**

**Project Description:**

Microbes (microorganisms) are found virtually everywhere on the planet. In fact, some are found in environments where nothing else can survive. There are microbes that live on and inside your body. In fact, they outnumber your own cells. Most of them reside in your large intestine and are necessary for the proper function of your digestion. Microbes have essential roles in many natural processes such as photosynthesis, uptake of nutrients by plant roots, and decomposition of dead or waste material. They are also necessary for producing many of the foods, medicines, etc. that people use. Most microbes are either viruses, bacteria, algae, or fungi. Most bacteria and fungi can be cultured (grown and maintained) in laboratory conditions using nutrient agar. You will culture bacteria and fungi that you find in the air, on common objects in your house, and on your skin. Be sure to read through the “Small things can be a big deal” powerpoint and watch the “Small things can be a big deal” video on YouTube at <https://youtu.be/6J9Y_urzZj8> . If you have questions, you can contact the author at scott.martin.hanson@ndsu.edu or at 701-231-8606.

**Project Objectives:**

1. Participants will understand how ubiquitous microbes are.
2. Participants will appreciate the pivotal role microbes play in the environment and human life.
3. Participants will learn the techniques for growing microorganisms on nutrient agar plates.
4. Participants will learn how to distinguish bacterial colonies from fungal colonies growing on nutrient agar plates.
5. Participants will appreciate the aesthetic beauty of diverse colonies growing together on the surface of nutrient agar.

**ND State Science Standards:**

9-10.2.2 Use appropriate safety equipment and precautions during investigations

9-10.2.6. Design and conduct a guided investigation

9-10.6.1 Use appropriate technology and techniques to solve a problem

11-12.2.2 Abilities Necessary to Practice Scientific Questioning: Select and use appropriate instruments, measuring tools, and units of measure to improve scientific investigations

**Materials and Equipment:**

**Materials in the kit:**

3 nutrient agar plates

**Materials you should look for around your house:**

Cotton swab (Q-tip)

Scotch tape

A marker, any color

**Activity 1:**

1. Make sure that you can find cotton swabs, Scotch tape and a marker.
2. With a marker, label ¼ of it as “unwashed finger”, ¼ of it as “washed” finger, ¼ of it as “cell phone” and ¼ of it as anything else you would like to examine, such as a doorknob, toilet seat or keyboard.
3. Use a cotton swab to rub a cell phone and then wipe it onto the surface of the nutrient agar.
4. Rub another cotton swab (or the other end of the same swab) on the optional surface you chose. Record the type of surface you chose in the Activity 1 Tables below in the cell right below the “cell phone” cell.
5. Touch your unwashed fingertip to the “unwashed finger” portion of the nutrient agar.
6. Wash your hands.
7. Touch your washed fingertip to the “washed finger” portion of the nutrient agar.
8. Seal the edge with Scotch tape.
9. Leave the plate undisturbed at room temperature for 48 hours.
10. Take a digital photo of the plate.
11. After 48 hours, take a look at the plate and record your results on the Results Table below.

**Activity 2:**

1. Label a nutrient agar plate “30 minutes”.
2. Lift the lid and let the plate sit undisturbed for 30 minutes.
3. Put the lid back on and seal the edge with Scotch tape.
4. Label a nutrient agar plate “4 hours”.
5. Lift the lid and let the plate sit undisturbed for 4 hours.
6. Put the lid back on and seal the edge with Scotch tape.
7. Leave the plate undisturbed at room temperature for 48 hours.
8. Take a digital photo of the plate.
9. After 48 hours, take a look at the plate and record your results on the Results Table below.

**Results & Discussion:**

Activity 1 Results: Bacteria

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Red | Pink | Orange | Yellow | White | Tan | Other |
| Cell phone |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| Unwashed finger |  |  |  |  |  |  |  |
| Washed finger |  |  |  |  |  |  |  |

Activity 1 Results: Fungi

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Red | Pink | Orange | Yellow | White | Tan | Other |
| Cell phone |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| Unwashed finger |  |  |  |  |  |  |  |
| Washed finger |  |  |  |  |  |  |  |

Activity 2 Results: Bacteria

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Red | Pink | Orange | Yellow | White | Tan | Other |
| 30 minutes |  |  |  |  |  |  |  |
| 4 hours |  |  |  |  |  |  |  |

Activity 2 Results: Fungi

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Red | Pink | Orange | Yellow | White | Tan | Other |
| 30 minutes |  |  |  |  |  |  |  |
| 4 hours |  |  |  |  |  |  |  |

Questions:

1. If any of your experiments did not produce microbes, why do you think it did not?
2. Which experiment had the fewest microbes? Why do you think that happened?
3. Which experiment had the most microbes? Why do you think that happened?
4. Which experiment had the least variety of microbes? Why do you think that happened?
5. Which experiment had the greatest variety of microbes? Why do you think that happened?