

# Growing Bacteria in a Culture

## Overview

Maria Yeung, Ph.D., performed research to find out exactly how bacteria stick to teeth and cause cavities. In this activities, students will grow cultures of their own oral plaque bacteria and test various inhibitory agents to see which one works best to kill the bacteria or curb their growth.

Note: This activity will take several days.

### Objectives

Students will...

- understand what a microbe is;
- grow a bacterial culture of microbes from the oral cavity;
- test inhibitory agents to determine effectiveness at inhibiting microbial growth; and
- organize a report of their findings.

### Materials

Students will need...

- Petri dishes, one per student
- Agar, enough to fill all the dishes
- Toothpicks, with a flat end
- “Culture Corner” work sheets
- Various agents for the students to test (toothpaste, mouthwash, pre-brushing wash, alcohol, etc.)
- Paper cups

## Vocabulary

**agar:** gelatin-like substance that contains nutrients and allows bacteria and other microbes to grow.

**bacteria:** a type of microbe.

**control:** a comparison sample used in science experiments that is the same as the experimental sample in every way except for the specific variable being tested. Controls are used to ensure that a result was obtained because of the experimental variable and not for some other reason.

**inhibitory agent:** a substance that keeps another substance from growing in its normal way.

**microbe:** short for microorganism. Any living thing that is too small to be seen with the naked eye.

**petri dish:** small round dish that scientists use to grow things that they want to use in experiments.

**plaque:** the thin film on the tooth that harbors bacterial growth and can lead to cavities and other tooth and gum diseases.

## Teacher Preparation

Prepare the petri dishes the day before class so they will have time to cool overnight. Heat up the agar according to the package directions and pour it into the petri dishes so they are halfway filled with agar. Make sure the petri dishes are sterile to ensure proper bacterial growth. There should be one petri dish per student.

## Student Activity

- 1 **Put students into groups** of four with others they do not normally work with. Introduce or review the vocabulary listed, explaining what a microbe is and how microbes affect your teeth in terms of plaque and cavity formation.
- 2 **Give each student a petri dish** and instruct them to draw a line down the middle of the underside of the dish with a permanent marker and to add the date and their initials.
- 3 Have the students use the flat end of a toothpick to gently **scrape some plaque off of their teeth**. They should then **spread the plaque** in a thin layer onto the petri dish, being careful not to break the surface of the agar. They need to deposit one sample on each half of the dish, for a total of two samples per petri dish. One sample will be the control, and the other will be used to test the growth-inhibiting agent.
- 4 Place the dishes in a warm place (37° Celsius) for two to three days to **allow the bacteria to grow**. Have the students **check the dishes daily and record observations** on the “Culture Corner – Mouth Microbes: Charting Bacterial Growth” work sheet.
- 5 Once the students have good bacterial growth, **assign each student in the group a different agent** (e.g., toothpaste, mouthwash, baking soda) so that every group in the class tests the same four agents.
- 6 **Prepare the solutions of inhibitory agents** the students will apply to their bacterial cultures. You can prepare a paper cup for each student with a mixture of toothpaste or mouthwash or other agent diluted with a small amount of water to make a liquid solution. Make sure that the dilution is the same for each student to ensure accuracy of results.
- 7 Show the students how to **apply a thin layer of inhibitory agent** to one half of their petri dish using a sterile application tool (toothpick or wire loop). Make sure they label which half is the control and which half is the experimental.
- 8 **Incubate the dishes at 37° Celsius** and have students record their observations daily on the sheet, “Culture Corner – How Well Does My Toothpaste Work?” Growth inhibition should be evident after one or two days.

## **Bringing it All Together**

- After the students have made their individual observations, bring the class together to record the class data so the students can see how their results compared to those of other groups. You may choose to have the students prepare group reports where they present to the class their results and conclusion (which agent worked best to inhibit bacterial growth).
- Brainstorm possible explanations for the results, including any unusual data.

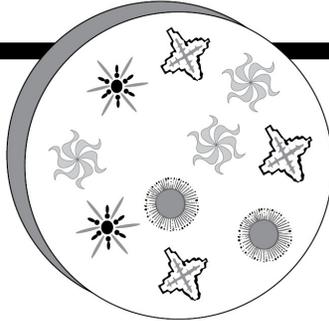
## **Extensions**

- Prepare microscope slides of the bacteria and let students see what the bacteria in their mouth look like. Have them draw representations of the microbes. Talk about why brushing and flossing your teeth is so important.
- Have students look at the ingredients on the packages of the agents they tested. Have them note similarities or differences between the “active ingredients” and form a hypothesis about why certain agents worked better than others.
- Have students do research on the Internet or in the library on various compounds found in the agents tested to find out how they work to kill or remove plaque bacteria.
- Have students perform the same experiment using bacteria from the oral cavity of an animal (cat, dog, etc.). Have them form a hypothesis explaining results that are similar to or different from those of the experiment with their own plaque.

Minority Women in Science: Forging the Way – Student Workbook

Mouth Microbes: Charting Bacterial Growth

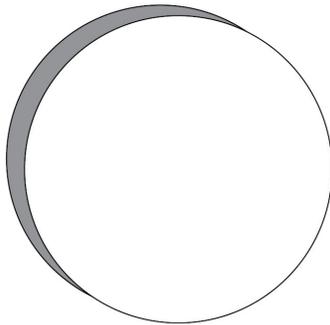
# Culture Corner



### Directions

Draw what your bacterial growth looks like in the corresponding circle representing your petri dish. For example, the day after you streaked your plaque onto the plate, draw your observations in the Day 1 circle. Describe your observations to the next to each drawing.

### Day 1



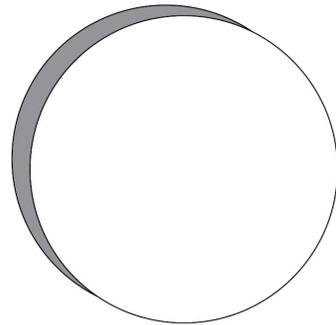
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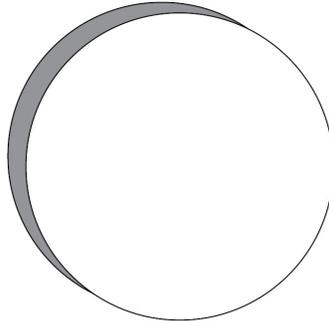
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### Day 3



### Day 2



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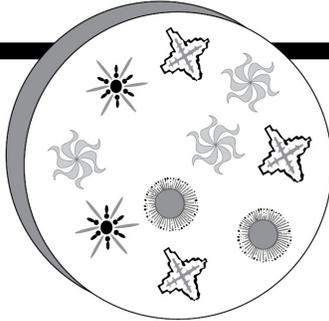
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**Minority Women in Science: Forging the Way – Student Workbook**

How Well Does My Toothpaste Work?

# Culture Corner



**Directions**

Draw what your petri dish looks like for each day after you have applied your inhibitory agent (toothpaste, mouthwash, etc.). Describe your observations next to each drawing.

**Day 1**

**Day 2**

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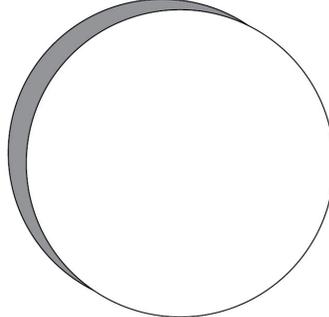
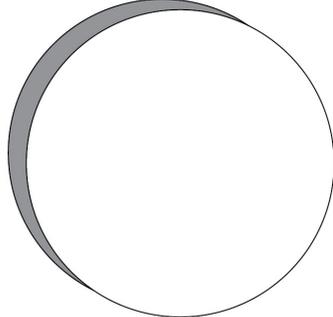
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Share your results with the rest of your group and compile a group table below.

Agent	Observations of Experimental Control Cultures