

Discovering the Conditions That Promote the Growth of Bacteria

I) **Problem: Which microenvironment promotes the growth of bacteria?**

The purpose of this activity is to investigate various microhabitats to determine which characteristics of these microhabitats most effectively promote the growth of bacteria.

II) **Background Information:**

When our healthy microenvironment is nearly perfect, it contains colonies of bacteria and a few yeast organisms that live together without harming us, and without our body working to fight off the organisms as it does whenever we have an infection.

Even though we can't see them, microbes are present wherever the proper conditions exist to sustain life. They live in and on humans and other animals, as well as on plants. They also live in the water, soil, and air. In this investigation, you will scavenge for bacteria in various microhabitats.

Bacteria are simple and small; they are single-celled prokaryotes, typically only 1 micrometer in diameter. They are among the most numerous life forms on the planet. Bacteria can be found everywhere other life exists and even many places too extreme for larger organisms.

Bacteria are so small that they cannot be seen without the aid of a microscope, so people didn't know they existed at all before 1676 when Anton van Leeuwenhoek used his handcrafted microscopes and keen eye to observe the bacteria living in a droplet of water,

Van Leeuwenhoek sought out bacteria and other microbes in many environments. He collected standing water from ponds and roadside ditches. He made infusions of peppercorns, hay, and beans. He also scraped the plaque from between his teeth. Each time he looked at something new he described his observations in his diary. To convince other people that he wasn't imagining his "wee beasties," he hired an artist to look through his microscopes and draw what he saw there.

When van Leeuwenhoek first looked at bacteria he had no idea how common they are nor how important they are to life on this planet. It took the research of many microbiologists who followed van Leeuwenhoek to explain the intricate relationships that exist between bacteria and larger organisms. Some bacteria cause disease, while other bacteria in our bodies are essential to our health. Bacteria in the soil decompose organic material (leaves, dead animals, etc.), turning it into usable food for plants. Bacteria are also crucial to modern biological research and biotechnology.

Bacteria can be cultured, or grown, on nutrient agar. Nutrient agar is a jellylike substance extracted from seaweed to which nutrients have been added so that bacteria or other microorganisms' can be grown on it. If conditions are favorable, bacteria will rapidly reproduce by dividing in two. Eventually, bacterial reproduction produces spots on the nutrient agar, each of which consists of the many descendants of a single bacterium. These spots, which are visible to the unaided eye, are called colonies.

III) **Hypothesis:**

I believe that if we measure the bacteria count at the beginning of the day, then at the end of the day the bacteria count will have increased in plain measuring.

IV) Experiment Plan:

Materials

Nutrient agar plates
China marker
Applicator swabs
1=toilet seat
2= social studies book
3= water fountain
4=locker room
5=math Promethean pen
6=keyboard
7=science floor
8=hair

Procedure

- 1) Be sure to follow sterile techniques during this lab so that contamination doesn't occur and ruin the results of this lab.
- 2) Using the china marker, draw a line on the bottom of your nutrient agar Petri dish dividing it in half. Number each half with a different number.
- 3) Select a variety of microhabitats to test for the presence of bacteria. Record the microhabitats in your data table. Identify characteristics of this microhabitat and record in your data table. (wet or dry, light or dark, clean or dirty, isolated or high-traffic)
- 4) With a sterile applicator stick, swab the given microhabitat.
- 5) Streak the swab across the center of the nutrient agar plate section in a straight line, beginning and ending about 2cm from each edge of the dish. Do not break through the nutrient agar. Try to keep each streak mark the same size. Remember, you will be applying two different streak marks from two different microhabitats to each nutrient agar plate. Keep the cover off the dish for as little time as possible.
- 6) Discard the applicator stick in the manner instructed by Mr. Ogden.
- 7) Repeat steps 4-6 for the other microhabitats.
- 8) Mr. Ogden will leave one dish untouched as a control.
- 9) Incubate the dishes for at least five days.
- 10) Record the growth of the microorganism on each plate in both qualitative and quantitative terms in the data collection section of this lab.

Experimental Components

Manipulated (Independent) Variable: *The factor or condition being tested*

Responding (Dependent) Variable: *The factor that responds to the change in the manipulated variable. The response is measured and recorded as data.*

Controlled (Constants) Variables: *All of the factors or conditions that are kept constant or normal during the experiment.*

Control: *The setup without the manipulated variable or the normal condition.*

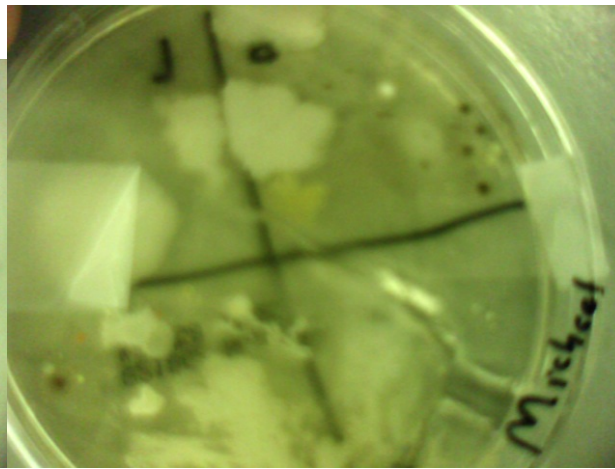
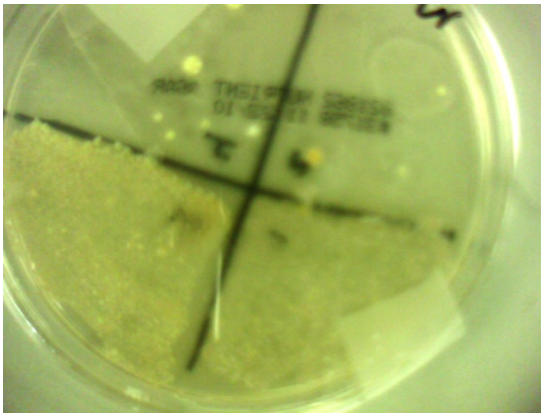
V) Data Collection:

Observations:

- Section 1: Bumpy, yellow bumps
- Section 2: 1 round white spot
- Section 3: Yellow and Bumpy
- Section 4: Little Yellow spots
- Section 5: yellow, bumpy
- Section 6: spots, very dirty
- Section 7: (control)

Data Table:

Section Number	Microhabitat	Microhabitat characteristics: dry/wet, clean/dirty, light/dark, isolated/high-traffic	Amount of bacteria 10-numerous/1-very few
1	Toilet Bowl	Wet, Dirty, Light	10
2	Social studies book	Dry, dirty, dark	6
3	Water Fountain	Dirty, wet, light	10
4	Locker room	Dark, dirty, dry	4
5	Math Promethean Pen	Light, dirty, dry	9
6	Keyboard	Dark, dirty, dry	7
7	control	-----	0



VI) Conclusion

1) Why was it important to keep the agar plates uncovered for as little time as possible? So the moisture won't escape.

- 2) Why was it important to observe sterile methods and use a new, sterile swab for each different microhabitat? So the bacteria won't spread and have combined bacteria.
- 3) Why was the nutrient agar sterilized before the investigation? So it would not increase the bacteria growth with the bacteria it already has.
- 4) Early biologists grew bacteria on freshly cut slices of vegetables. Why would it be important to have "freshly cut" vegetable slices? So the slices did not "catch" bacteria while sitting out.
- 5) What was the purpose of the control? To see what the normal bacteria was and to have the results vary between places.
- 6) Which microhabitat seemed to result in the most bacterial growth? The Toilet Bowl
- 7) Aside from the control, which microhabitat seemed to result in the least bacterial growth? Locker room
- 8) What kinds of microhabitat characteristics seem to have the greatest impact on the growth of bacteria? Wet and Dry.
- 9) There are thousands of different kinds of bacteria. Do you think that shape alone is enough to identify a particular species of bacteria? Why? Yes because the bacteria is classified by shape, size, and texture.
- 10) Do all the bacteria colonies have the same appearance (i.e. color, shape, and size)? If not, what does that indicate?