

Discovering the Conditions That Promote the Growth of Bacteria

I) Problem:

Which microenvironment is best for promoting growth of bacteria?

II) Background Information:

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 neither bacterium he had no idea how common they are or 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.

Nutrient Agar is a microbiological commonly used for the routine cultivation of bacteria. It is useful because it remains solid even at relatively high temperatures. Also, bacteria grown in nutrient agar grows on the surface, and is clearly visible as small colonies. In nutrient broth, the bacteria grow in the liquid, and are seen as a soupy substance, not as clearly distinguishable clumps. Nutrient agar typically contains

Hypothesis:). If the dustpan has the most bacteria then a swab taken from it would have the most bacteria.

III)

IV) Experiment Plan:

Materials

Nutrient agar plates

China marker

Applicator swabs

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: Different habitats

Responding (Dependent) Variable: *Measuring bacteria growth* Controlled (Constants) Variables:

Temperature of bacteria and the amount of time swabbing.

Control: Nutrient Agar only, nothing was swabbed on.

V) Data Collection:

(Data should be recorded in both a qualitative and quantitative format. Qualitative data would be recorded as general observations. Quantitative data involves the recording of numbers, usually through measurements of some type.)

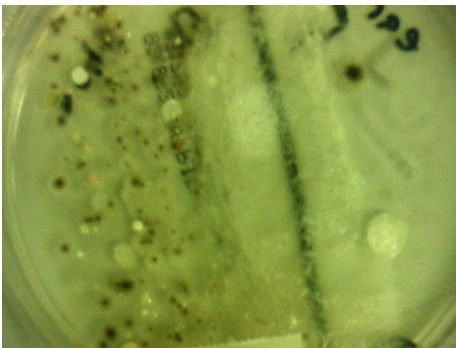
Observations:

- Section 1: Dots and nasty
- Section 2: Blank clear
- Section 3 One big dot
- Section 4: looks like dipping dots
- Section 5:
- Section 6: 5
- Section 7: 1

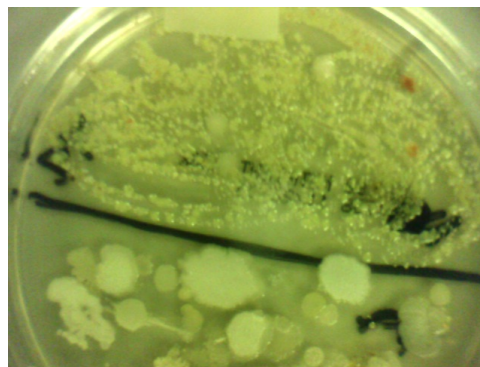
Data Table:

Section Number	Microhabitat	Microhabitat characteristics: dry/wet, clean/dirty, light/dark, isolated/high-traffic	Amount of bacteria 10-numerous/1-very few
1	Ear	Wet and dirty	4
2	Shoe	Clear and dry	2
3	Mirror	Empty	3
4	Mouth	Dirty isolated	6
5	Dustpan	Dirty wet	7
6	Fountain	Wet and dirty	5
7	control	-----	1

Photographs:
 Insert digital photos



This 1 and 2



This 5 and 6



This 3 and 4

Conclusion

- 1) Why was it important to keep the agar plates uncovered for as little time as possible? Because or else it will come out spread.
- 2) Why was
It important to observe sterile methods and use a new, sterile swab for each different microhabitat? Because then the bacteria wont are mixed together if they were then you wouldn't have exact readings.
- 3) Why was the nutrient agar sterilized before the investigation? So there is only the thing you want to test on the agar.
- 4) Early biologists grew bacteria on freshly cut slices of vegetables. Why would it be important to have "freshly cut" vegetable slices? A freshly cut vegetable slice would be cleaner then that was cut a week ago.
- 5) What was the purpose of the control? The purpose of control was that without it then we would have no clean agar, which would affect project.
- 6) Which microhabitat seemed to result in the most bacterial growth? The dustpan was the most bacterial growth so my hypothesis was right.
- 7) Aside from the control, which microhabitat seemed to result in the least bacterial growth? The least was probably the toilet it looks the same, which is surprising because toilets are supposed to have the most bacteria.
- 8) What kinds of microhabitat characteristics seem to have the greatest impact on the growth of bacteria? Dirty and wet are the microhabitats for the most growth of bacteria.
- 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? No because you need the color size amount.
- 10) Do all the bacteria colonies have the same appearance (i.e. color, shape, and size)? If not, what does that indicate? No because some color is green and orange some a little bacteria and another filled with bacteria.

