UNLOCKING SCIENCE HANDS ON!

BACTERIA ARE EVERYWHERE!

When we talk about bacteria being everywhere, the official scientific word we use is ubiquitous. This means bacteria can be found in soil, water, plants, animals, and even humans! Anton van Leeuwenhoek was a Dutch businessman and scientist who was one of the first to observe and describe bacteria using a microscope and is considered the Father of Microbiology (the study of microbes). Bacteria are a type of microbe, along with certain species of fungi, algae, and protozoans. Leeuwenhoek called the organisms he saw "animalcules," meaning little animals. He was especially fond of looking at microbes that grew in the human mouth (yuck!).

There is no mention of bacteria in the Bible, but since they are living organisms, we know God created them. It's likely he created them on days 3, 5, and 6. Free-living bacteria in the soil were likely created on day 3 when land was created. Also, bacteria in symbiotic relationships with plants (mutually helpful relationships) on day 3. Bacteria in symbiotic relationships with swimming and flying creatures on day 5 and land animals and humans on day 6. It's also possible that free-living bacteria associated with air and water were created on day 2. However, the role of bacteria is usually to serve as a connection between the physical and biological world, so it's unlikely since there were no living things created on that day.

Extra Family Fun: Make round sugar cookies (to simulate Petri dishes) and decorate them with icing to resemble the bacterial colonies you grew from around your home.

Bacteria in the Home

Supplies

- Plain or unflavored gelatin powder (in envelopes) (or agar)
- Sugar
- Beef bouillon cubes or granules
- Foil muffin cup liners and muffin pan (or Petri dishes)
- Toothpick
- Permanent marker
- Cotton swabs (preferably from unopened package)
- Zipper bags

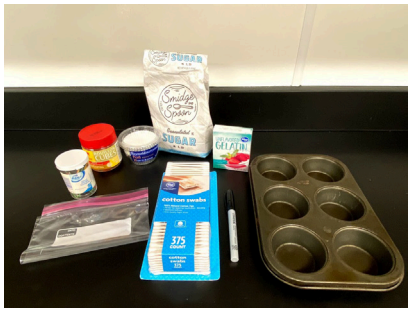

Figure 1: Supplies

Procedure to Make Growth Media for Bacteria

1 In a saucepan, mix 4 envelopes of gelatin (for agar, refer to instructions on packaging) with 4 cups cold water, 8 teaspoons sugar, and 4 bouillon cubes (or 4 teaspoons of bouillon granules).

2 Bring slowly to a boil, stirring constantly.

3 Cool slightly and fill foil muffin cup liners (in muffin pans for support) (or Petri dishes) about ⅓–½ full with the hot gelatin solution.

4 Cool until gelatin is solid (refrigeration is recommended). DO NOT touch the surface of the gelatin and DO NOT eat.

5 Store filled foil muffin cup liners in zipper bags in the refrigerator. Use within 2–3 days.

Procedure for Sampling Surfaces

1 Wash hands thoroughly.

2 For each foil muffin cup liner, use toothpick to divide into 4 sections (Figure 2). The number of muffin cup liners with gelatin you need will be determined by how many locations you choose to sample. You can do 4 locations per liner. Be careful not to touch the gelatin with your hand.

Figure 2

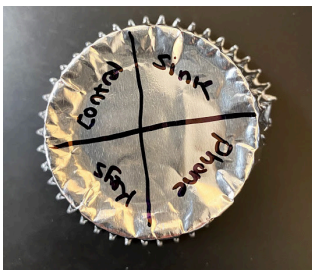

Figure 3

3 On bottom of foil muffin cup liner, label each section with sampling location (Figure 3) and whether it is before or after cleaning the sampling location.

4 For control, swab one section of liner with a clean cotton swab that has not been used.

5 For each sampling location, swab area and then swab gently across the surface of the corresponding section on liner (Figure 4). Place each foil muffin liner in its own plastic zipper bag but do not seal completely. Leave a small section unzipped so the bacteria can get air.

Figure 4

6 Next, clean each sampling location with a household cleaner that states it kills bacteria. Wait 15 minutes. Re-swab sampling location as done in Step 5 onto new foil muffin cup liner with gelatin that is labeled.

7 Observe and record growth at 24, 48, and 72 hours. DO NOT remove foil muffin liner from bag and DO NOT touch surface of gelatin.

8 Dispose of bags with liners in the trash when observations are complete.

Activity: Observing Growth

Count the number of bacterial colonies after 24, 48, and 72 hours. Record in the table. The colonies will appear as small dots on the surface of the gelatin.

Data Table

Location	24 hours	24 hours (clean)	48 hours	48 hours (clean)	72 hours	72 hours (clean)
Control		N/A		N/A		N/A

Record general observations about the characteristics of the colonies (shape, color, size).

Analysis Questions and Discussion

1 What is a bacterial colony? *A visible mass of bacteria all originating from a single mother cell. A single bacteria grew into each of the colonies on your gelatin.*

2 Did you have more colonies as time progressed? *Answers will vary. It is likely that more colonies will appear up to 48 hours, but they should continue to grow in size.*

3 Did any colonies grow in the control section? If this occurred, what might that tell you about the growth from the sampling locations? *Answers will vary. If this did occur, there is a source of contamination (e.g., cotton swab, inside the bag). This means that growth observed in other sections may not be truly representative of those locations and may be contamination.*

4 What types of colonies grew? Were they fuzzy, shiny, have grooved or rounded borders, etc.? *Answers will vary.*

5 Look online for images of bacterial colonies and try to determine what type of bacteria you may have grown.

6 Did you notice a difference between the sampling locations before and after cleaning? Was the household cleaner effective at killing bacteria? *Answers will vary. It would be expected that the cleaner would reduce the number of colonies.*

7 As a result of this experiment, do you think you will clean certain areas of your home more often? *Answers will vary.*

"For by him all things were created, in heaven and on earth, visible and invisible, whether thrones or dominions or rulers or authorities- all things were created through him and for him."
Colossians 1:16 (ESV)