Background

Today’s activity tests how widespread microorganisms are in our environment and whether they are passed from person to person through casual contact. Microorganisms seem to be everywhere, including inside and on us. They are mostly single-celled organisms (i.e., they’re made of only one cell), and they include organisms we classify as bacteria, some types of fungi (e.g., yeast), and some protists. I'm omitting viruses because they aren’t “organisms” in the way we typically define living organisms -- they lack the machinery to reproduce on their own and they aren’t even a cell.. As the name microorganism implies, microbes are tiny. In fact, they are so tiny that single individuals can be seen only with microscopes. Some microorganisms are pathogens, which means they cause harm when they infect other organisms. We typically call these microorganisms “germs.” For example, *Streptococcus pyogenes*, is the species of bacteria that causes strep throat. *Salmonella* is a genus of bacteria that commonly causes food poisoning. Practically all infectious diseases are caused by microorganisms. However, the number of microbes that cause disease is a proverbial “drop in the bucket” compared to the number of microbes that don’t cause disease and that are, in fact, beneficial. For example, some species of bacteria live in our mouths, our colons, and elsewhere without causing harm and in some cases even benefiting us. I’ve read that there are more cells of bacteria living in an on us than there are cells that make us. Other microbes are used to make bread, beer, cheese, and many other foods as well as some medicines. They are also fundamental to bioengineering that’s used in agriculture and medical research. Life would not be possible without them because they “fix” nitrogen and recycle the elements required by all organisms. Finally, microbes are the oldest organisms on the planet, having been around for about 3.5 billion years, as evidenced by stromatolites.

Handshake Experiment: You’ll be working with a safe strain of *Eschericia coli* (*E. coli*), a bacterial species that lives in the colon of mammals, including people.

1. Work in a group of 3 or 4. Identify one person as “person 1,” another as “person 2,” and so on.

2. Put on latex or nitrile gloves

3. You’ve been given two plates for growing microbes. Keep them closed until instructed to work with them. Label the bottom (the smaller half) of one plate with your name, the day & time that your class meets, and whether you are person 1, person 2, person 3, or person 4 in your group.

4. There’s a tube or flask of broth containing *E. coli* on your bench. Swirl the tube of broth and then soak a sterile cotton swab in the broth. Reseal the tube of broth. Please keep the swab sterile before placing it in the tube, and please keep the tube and its lid uncontaminated by immediately closing the tube and not placing the lid on any surface or touching their inside surfaces.

5. Thoroughly swab person 1’s right hand. Dispose of the cotton swab in the Bio Hazard bag.

6. Person 1 shake person 2’s hand. Person 2 then shake person 3’s. Person 3 shake person 4’s hand.

7. Thoroughly wipe a new sterile cotton swab over your hand (the one you used in the handshake), and then gently sweep the swab all over the surface of the gel-like stuff inside the labeled plate. Do not place the lid on the bench when you’re doing this, and do not touch the inner surface of the lid with your fingers. Doing either risks contaminating your plate.

8. Place the group of four plates in an incubator heated at 37°C. This is the temperature inside our bodies. Next lab period you’ll measure how much microbial growth occurred on the plates of each group member. The result will tell you how many people can become infected with microbes like this one from one original infected person.
Self & Environmental Samples:
1. Keeping your second plate closed, mark the **bottom of it** to identify four equally sized sections. Write your name and the day & time that your class meets on the bottom of the plate very near the edge. Be sure to leave room to label each quadrant you marked off.

2. Divide one of quadrants in half. Label one of the halves “mouth.” Label the other other “bellybutton.”

3. Thoroughly sample the inside of your cheeks & gums with a sterile cotton swab. Holding the swab with one hand and holding your plate’s lid with the other hand, **gently** sweep the swab over the **surface of the gel** in the are labeled “mouth.” **CLOSE THE PLATE.**

4. GET A NEW cotton swab, sample your belly button, and then gently sweep the swab over the surface of the gel in the area labeled “bellybutton.”

5. Find or decide on three different objects in the building or outside that you want to test for microbial growth. It will be better if you decide before hand so that you can label your quadrants before inoculating them. Use a new cotton swab for each, and inoculate only one quadrant of your plate with each. Label each quadrant accordingly. For example, if you want to know whether microbes grow on door knobs, wipe a door knob well with a fresh cotton swab, and then gently sweep the swab in one of your plate’s quadrants, and then label the quadrant “door knob.”

6. Take your plate to the teacher’s desk. Your plates will be incubated at 37°C. You’ll measure growth next lab period.

Questions
1. Do you think you’ll find that microorganisms live in your mouth or on your skin? Explain your rationale.

2. If microorganisms do live in your mouth or on your skin, what does that suggest about their harmfulness? Explain your rationale.

3. Do you suppose microorganisms that harmlessly live on one part of your body, say the skin, might cause harm if they are transferred to another part of your body, say the blood? Explain your rationale.

4. Do you think microorganisms on person’s hands can be transferred to other objects or to other people through casual contact? For example, if someone sneezes onto her hand or if someone handles raw meat/eggs and then your hamburger, how likely is it that you’ll be eating the microorganisms from the sneeze, the meat, or the eggs? Explain your rationale.