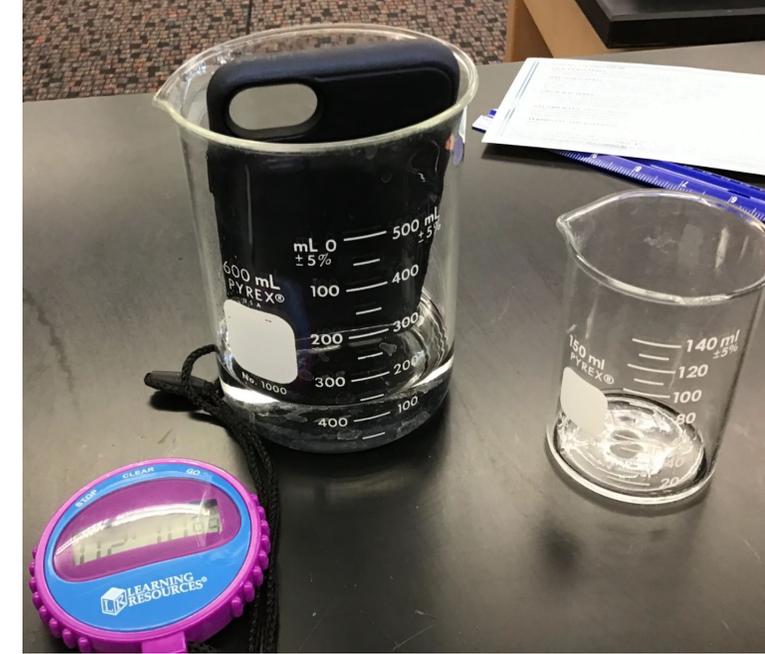


# The Effect of Cleaning Methods on the Approximate Bacterial Count of a Cell Phone Case

Sawyer Berness

# Hypothesis

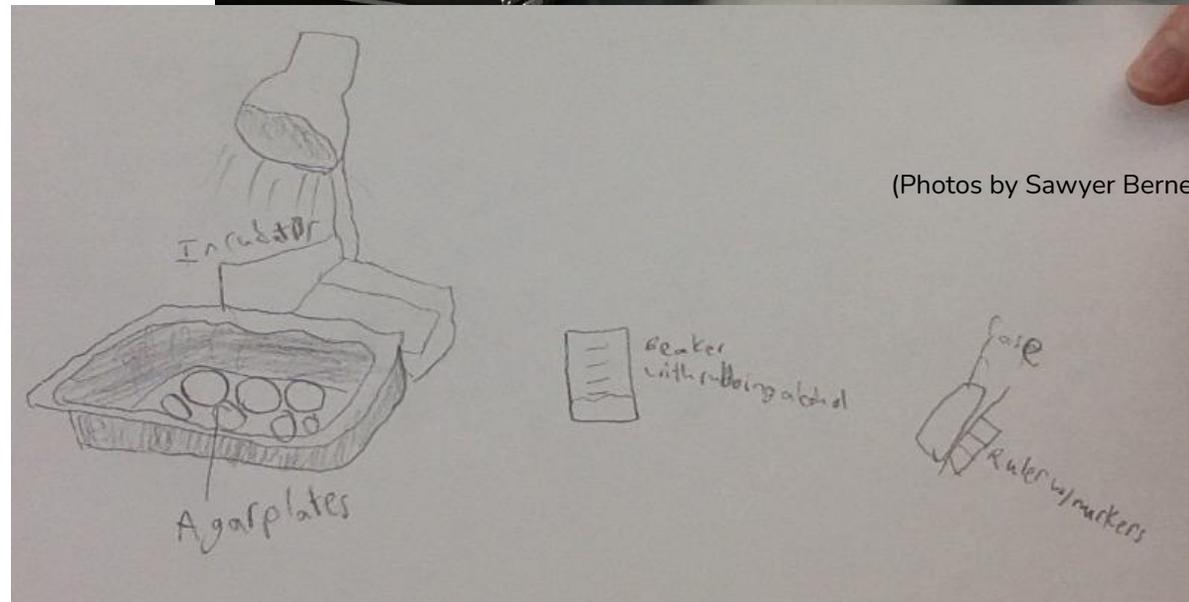
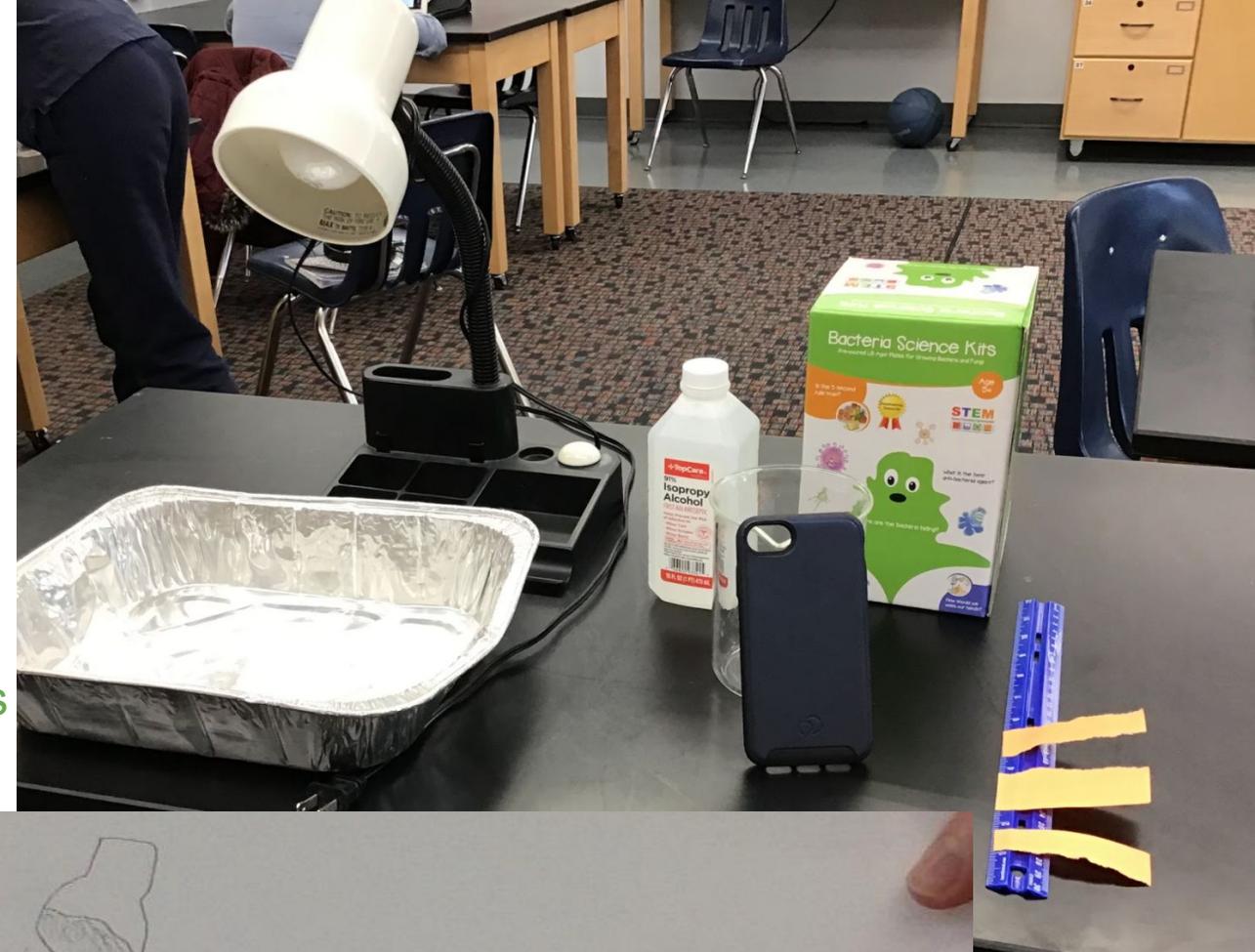
If three methods of cleaning are tested (wet wipe, soap and water, soaking in rubbing alcohol), washing with soap and water will be the most effective. The CDC recommends cleaning using water and a “detergent solution” to clean objects that are dirty. They also recommend washing your hands instead of using hand sanitizer or wet wipes. Hand sanitizer’s active ingredient is isopropyl alcohol, which I will test in this experiment as well as wet wipes. If the CDC’s recommendation is correct, the soap and water will be the most effective.



(Photo by Sawyer Berness)

# Materials

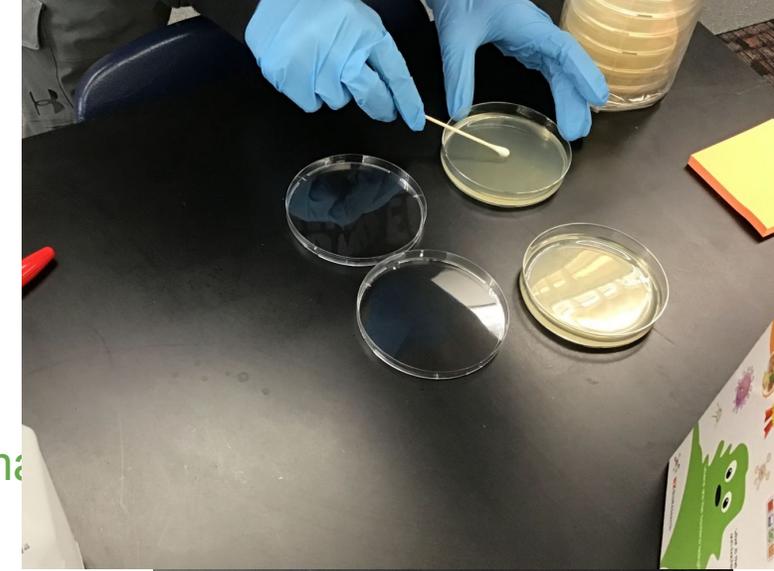
- 120 ml 70% isopropyl alcohol
- Hand soap and tap water
- 1 wet wipe or wet paper towel
- 12 pre-prepared Agar plate
- Used cell phone case, ruler, and 12 cotton swabs
- 1 bowl or beaker
- 1 metal tray with high walls and lamp
- A post-it or other marker



(Photos by Sawyer Berness)

# Procedure

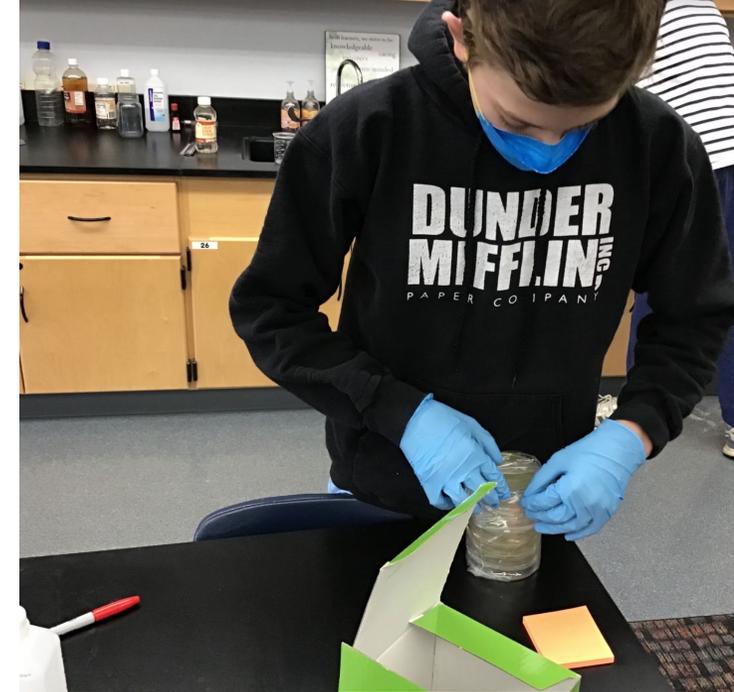
1. Lay the cell phone case next to the ruler. Using the ruler, put strings or marks every two inches or so as to divide the case into four areas.
2. Using one swab at a time, slowly rub the swab in a motion like striking a match along the back of the cell phone. Take two samples from area 3. After each individual swab has completed this motion, rub the swab in a zigzag motion along the surface of the liquid in an Agar plate for thirty seconds or follow the manufacturer's instructions (Use one dish per swab). Use separate dishes for each and label the dishes. Discard swabs after use.
3. Next, take the wet wipe and clean area 2 of the case. Take two samples of this cleaned area and put them on Agar plates using the same method as before, making sure to label them. Dry the phone case.
4. Take soap and water and wash off the top area of the case (area 1) with soap and water. Hold the case upside down so the water does not clean the rest of the case. Take another two samples of bacteria plates from area 1 and label them.



(Photos by Sawyer Berness)

# Procedure

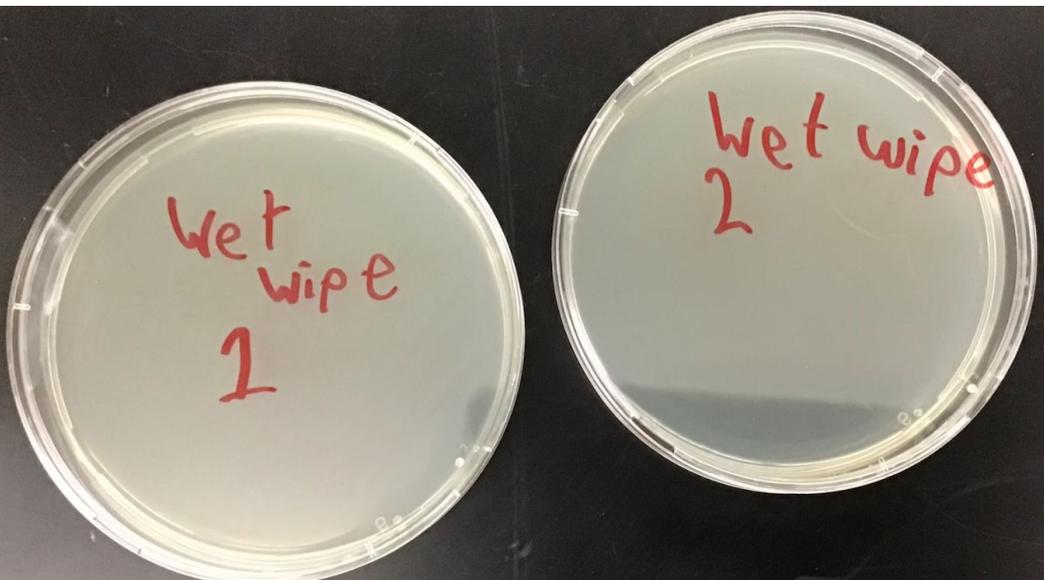
5. Pour 120 ml of isopropyl alcohol into a beaker. Put the phone case into the alcohol, making sure the bottom area (4) is covered, and leave it there for five minutes (time with the stopwatch). Take the case out and take the final two samples from area 4. Label them as well.
6. After this is done, put the lids on the plates (leave them slightly ajar). Then, place the plates into the tray (keep them flat) and turn on the lamp (make sure it is pointing at the samples). Give the bacteria exactly three days to grow.
7. At the end of the waiting period, remove the samples from the box. Count the colonies of bacteria on the samples. Take pictures and record data.
8. Spray all bacteria with isopropyl alcohol. Put the agar plates in a Ziplock and seal. Dispose of all bacteria in trash. **DO NOT KEEP ANY BACTERIA OR PLATES.**



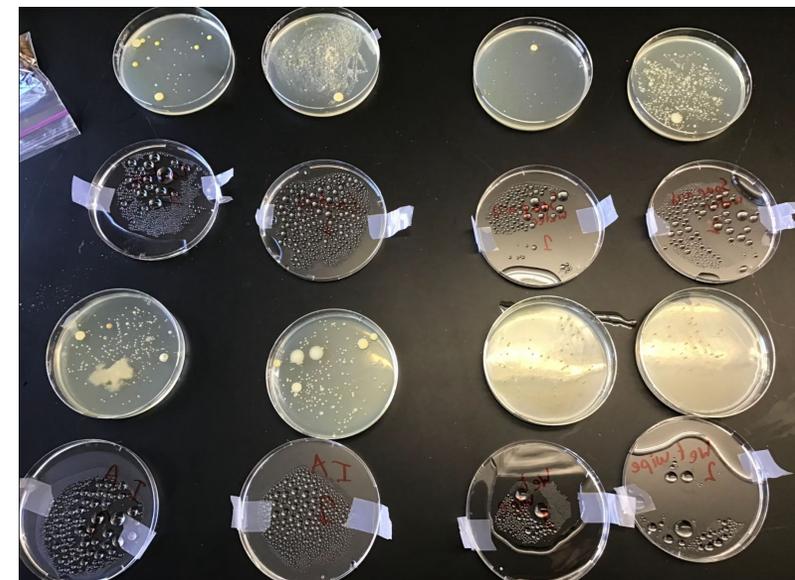
(Photos by Sawyer Berness)

# Data

	Area 1 (Soap and Water)	Area 2 (Wet Wipe)	Area 3 (Control)	Area 4 (Isopropyl Alcohol)
Plate 1	Number of colonies: 1 large and 13 small	Number of colonies: 52 small	Number of colonies: 8 large 23 small	Number of colonies: 4 large and about 50 small
Plate 2	Number of colonies: 1 large and >50 small	Number of colonies: 25 small	Number of colonies: 1 large and too many small to count (speckled)	Number of colonies: 6 large and 45 small



(Photos by Sawyer Berness)

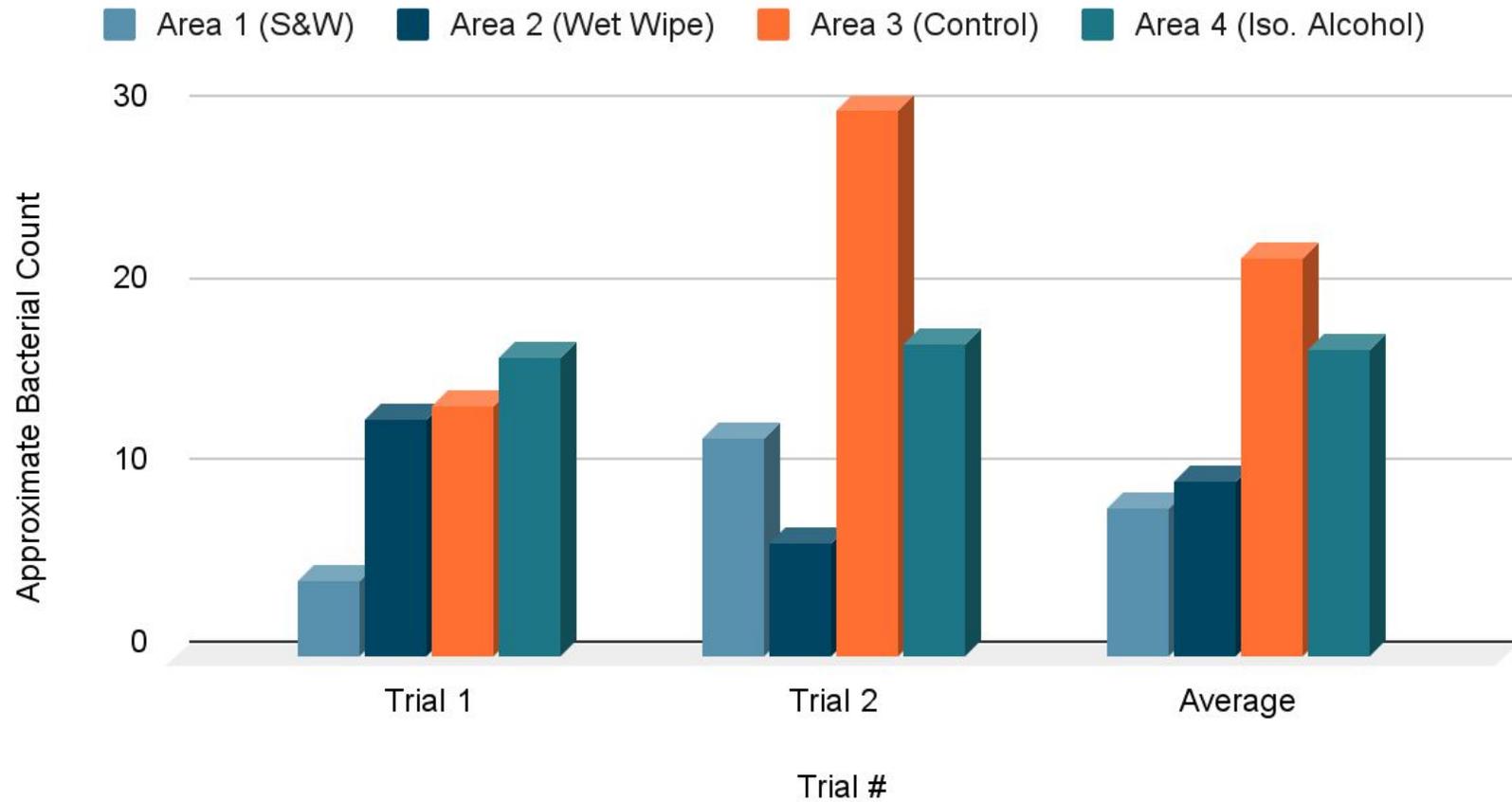


# Data

## Graph

(Note: This graph counts each small colony as  $\frac{1}{4}$  and each large colony as 1 and estimates for the  $<$  or  $>$  numbers.)

## Cell Phone Cleaners



(Chart by Sawyer Berness)

# Analysis

There was the most bacteria on the soap and water cleaned samples, the second most bacteria on the wet wipe slides, and the third most bacteria on the isopropyl alcohol slides. I interpret this data to mean that the soap and water killed the most bacteria, the wet wipe killed the second most, and the isopropyl alcohol. This is probably because germs spread most from wet surfaces (Frequent Questions). The soap and water scrub air dried almost immediately, and the wet wipe dried the phone as well as cleaned it. My results may not have been entirely accurate because the soap and water sample, with the least amount of bacteria, was taken from the top of the phone, and the the isopropyl alcohol sample, with the most bacteria of the three cleaning methods, was taken from the bottom. The phone is usually held by the bottom, so the isopropyl alcohol may have had more bacteria to begin with



(Photo by Sawyer Berness)

# Summary

This experiment tested the effect of different cleaning methods on amounts of bacteria on a cell phone case. The bacteria samples taken from the area cleaned with soap and water had the least bacteria on them. These results agree with both my hypothesis and the CDC's research.



(Photo by Sawyer Berness)

# Works Cited

CDC. “Frequent Questions About Hand Hygiene | Handwashing.” *CDC*, <https://www.cdc.gov/handwashing/faqs.html>. Accessed 28 January 2022.

Higuera, Valencia, and Tim Jewell. “The 9 Dirtiest Places in Your Home: Find Out Where the Germs Live.” *Healthline*, <https://www.healthline.com/health/germy-placesNumbergood-habits>. Accessed 28 January 2022.