SASTA OLIPHANT SCIENCE AWARDS

Prize Winner

Science Investigation

Year 3 - 4

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Pembroke School - Middle School

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Would you put your face on a toilet? Investigating bacteria on mobile phones

By: Alexander Praino

Pembroke School, Year 3

Questioning and Predicting (250 words)

Introduction:

People take their mobile phones everywhere, sometimes even to the toilet. Our phones pick up germs along the way, with 94.5% having bacterial contamination.[1] According to experts, smartphones carry ten times more microbes than toilets![2] Typical phones have >25,000 bacteria per square inch- dirtier than kitchen counters, dog bowls or doorknobs![3]

Bacteria on phones include skin bacteria like *Staphylococcus* and *Streptococcus*[4] and bacteria from faeces, like *E. coli!*[5] These cause multiple diseases, including skin infections, strep throat and gastrointestinal illnesses (vomiting/diarrhea).

Bacteria get onto phones from the environment and our own hands. In fact, people touch their phones once every 12 minutes- 80 times per day![6] Concerningly, 52% of people use their phone in the bathroom.[7] This may be why 1 in 6 phones have *E. coli*![5] Once bacteria transfer to phones, this is a problem because phones produce heat and are kept in warm environments, like pockets or hands, where bacteria thrive.[3]

Although toilets are regularly cleaned, phones rarely are. In Australia, public restrooms must be cleaned up to 5-8x daily for high traffic areas, like shopping centres.[8] However, 57% of people never clean their phone![7] Germs living on phones can transfer to people's fingers and faces, making them sick.

Question: Are mobile phones dirtier than a public toilet, and does disinfecting them with either UV radiation or an antibacterial wipe reduce bacteria?

Hypotheses:

1. Mobile phones will contain more bacteria than a toilet.
2. Disinfecting mobile phones with either UV radiation or antibacterial wipes will reduce, but not eliminate, bacteria.

Planning and Conducting (439 words)

Reasoning:

Dependent variables measured:

- Colour/shape/size of bacteria grown from samples from public toilets or phones (before/after being disinfected)

Independent variables changed:

- Surface sample was collected from
- Disinfection method

I collected samples from two public toilets (A1-A2) and four different phones (B1-B4). I then wiped two phones with antibacterial wipes (C1-C2) and put two in the HomeSoap UV steriliser (D1-D2) before sampling each again. Having multiple of each condition replicated my results and controlled for differences, like if one phone/toilet was cleaner or dirtier. I also compared each phone to itself before and after sterilising to control for potential differences. One dish had only agar to control for environmental contamination.

Participants:

- 4 people willing to have phone swabbed, disinfected and swabbed again

Materials:

- Sterile swabs x10
- Petri dishes x11
- LB Agar powder (ThermoFisher Scientific)
- Distilled water
- Weigh boat
- Aluminium foil
- 25mL disposable pipette
- Antibacterial wipes (Dettol 2in1 Hand and Surface)
- Masking tape
- Marker

Equipment:

- Scientific balance
- Spatula
- Hot plate
- Stir bar
- 500mL flask
- Pipette gun
- HomeSoap UV-steriliser

- Phones x4

Risks: Be careful when mixing/pouring hot agar and plating/handling Petri dishes! Ask an adult for help and wear protective equipment. Keep dishes taped closed once finished plating samples.

Method (Figure 1):

Make agar plates:

Note: Wear lab coat, gloves and goggles while mixing/pouring agar!

I followed GrowNextGen's method:[9]

1. Weigh 18.5g of LB agar powder using scientific balance and transfer to 500mL flask.
2. Add distilled water to line, swirl and add stir bar.
3. Cover with foil and heat, stirring, until agar boils. Turn down heat and simmer for ~10 minutes.
4. Let agar cool slightly before pipetting 20mL into each dish. Work fast because agar hardens quickly as it cools. Let plates set for 60 minutes.

Collect samples:

Note: Wear gloves while collecting samples!

5. Collect samples from two different public toilets using sterile swabs (A1-A2).
6. Find four people willing to have phone swabbed. Explain project and ask them to sign consent form.
7. Collect baseline swabs from each phone (B1-B4).
8. Wipe two phones with antibacterial wipes (C1-C2). Place two phones in Homesoap UV-steriliser (10 minutes) (D1-D2).
9. Collect swabs from each phone after disinfecting.

Plate samples:

Note- Wear lab coat and gloves when plating samples!

10. Rub swab A1 onto plate using zig-zag motion.
11. Put lid on plate and tape shut. Label lid.
12. Repeat for samples A2-D2.
13. Store plates upside down at room temperature for 7 days. Monitor daily for bacteria growth and record findings. Photograph on Days 4-7.
14. On day 7, discard plates (see risk assessment).

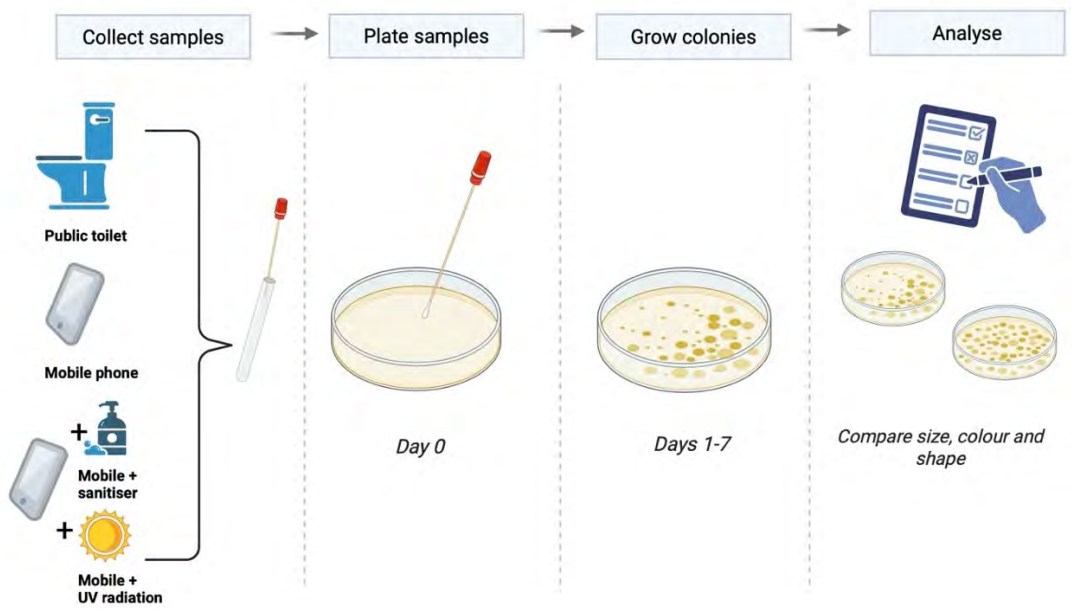

Figure 1: Summary of methods. Figure made with BioRender.

Photos of procedure (Figures 2-3):

Figure 2: Weighing and mixing the agar. Left: Weighing out the LB agar powder on the scientific balance. Middle: 18.5g of LB agar powder in the weigh boat. Right: Mixing the agar solution before boiling.

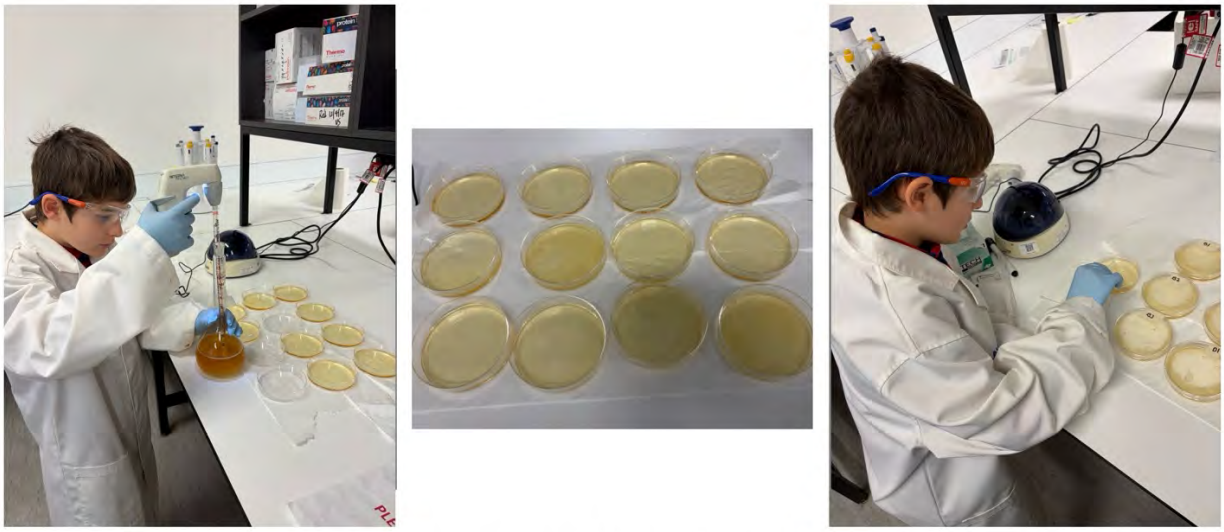

Figure 3: Pouring the agar and plating the samples. Left: Pipetting out 20mL of agar solution into each Petri dish. Middle: Allowing the agar plates to set over 60 minutes. Right: Transferring the samples to the agar plates by rubbing each swab on the plate in a zig-zag motion.

Processing and Analysing Data and Information (72 words)

Photos of plates on Day 7 (Figures 4-8):

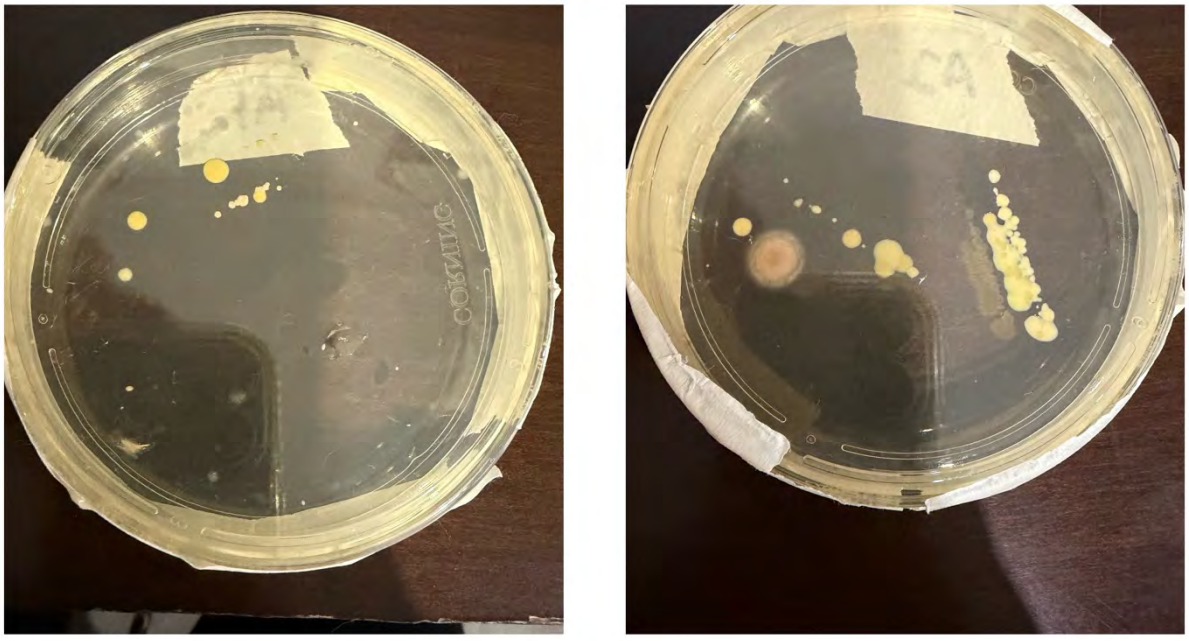

Figure 4: Both samples collected from the toilets have evidence of bacteria and mold on Day 7. The sample collected from A2 (right) shows more contamination than the sample collected from A1 (left).

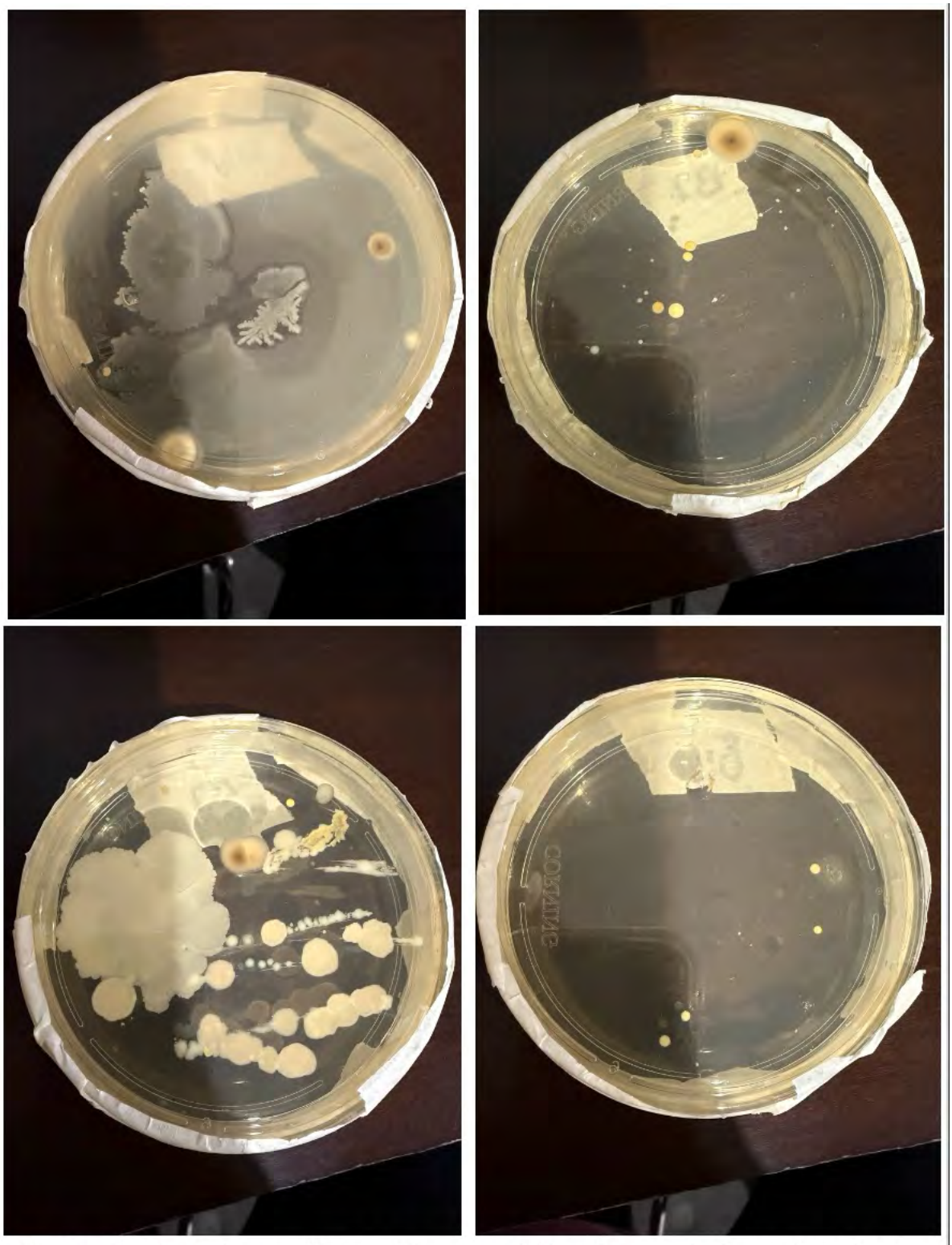

Figure 5: Samples collected from mobile phones before cleaning have clear evidence of both bacteria and mold on Day 7. Top row, from left to right: B1, B2; Bottom row, from left to right: B3, B4.

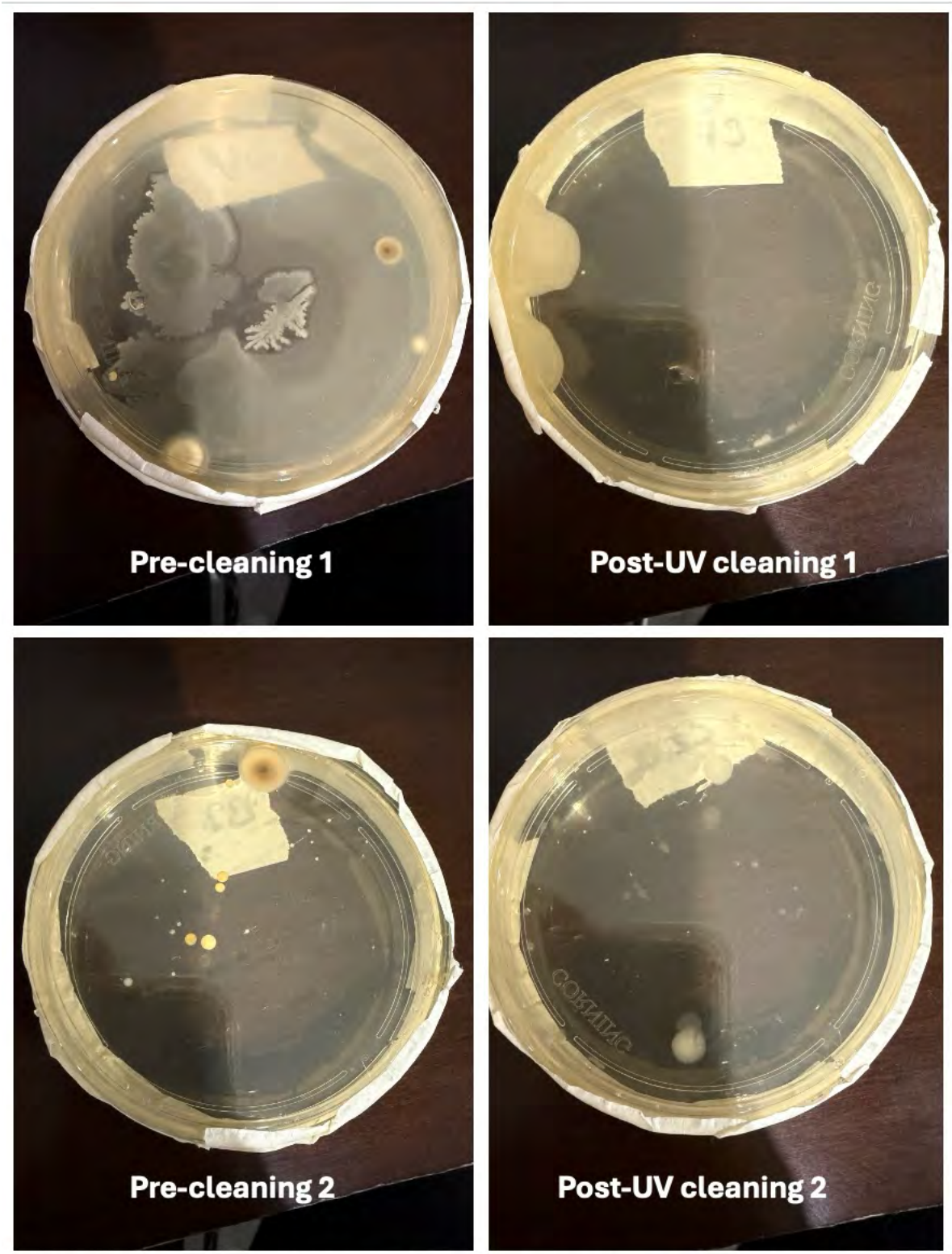

Figure 6: Compared to prior to cleaning (left images), UV radiation (right images) largely eliminated the bacteria and mold seen on Day 7. Top row: B1, C1; Bottom row: B2, C2

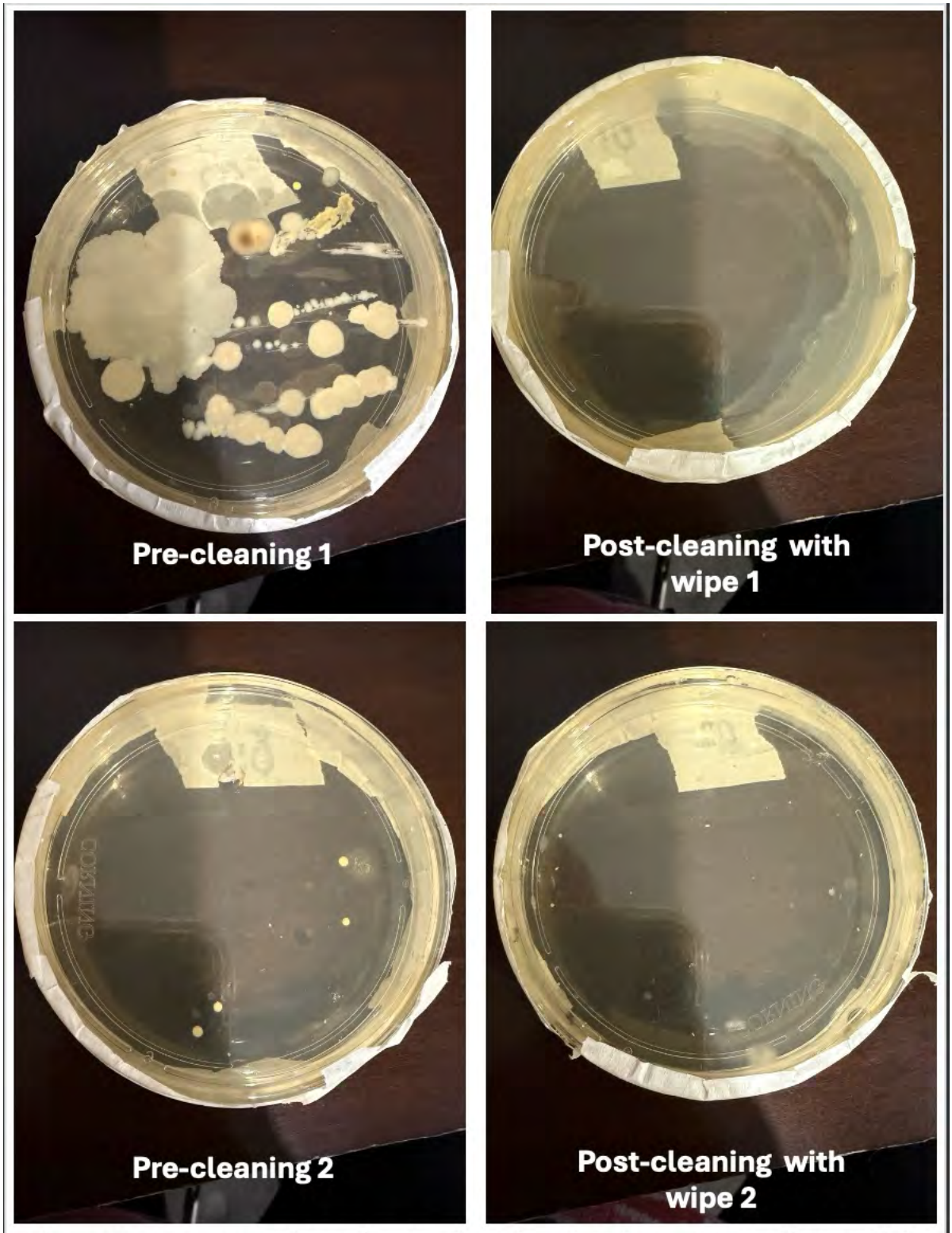

Figure 7: Compared to prior to cleaning (left images), antibacterial wipes (right images) essentially eliminated the bacteria and mold seen on Day 7. Top row: B3, D1; Bottom row: B4, D2

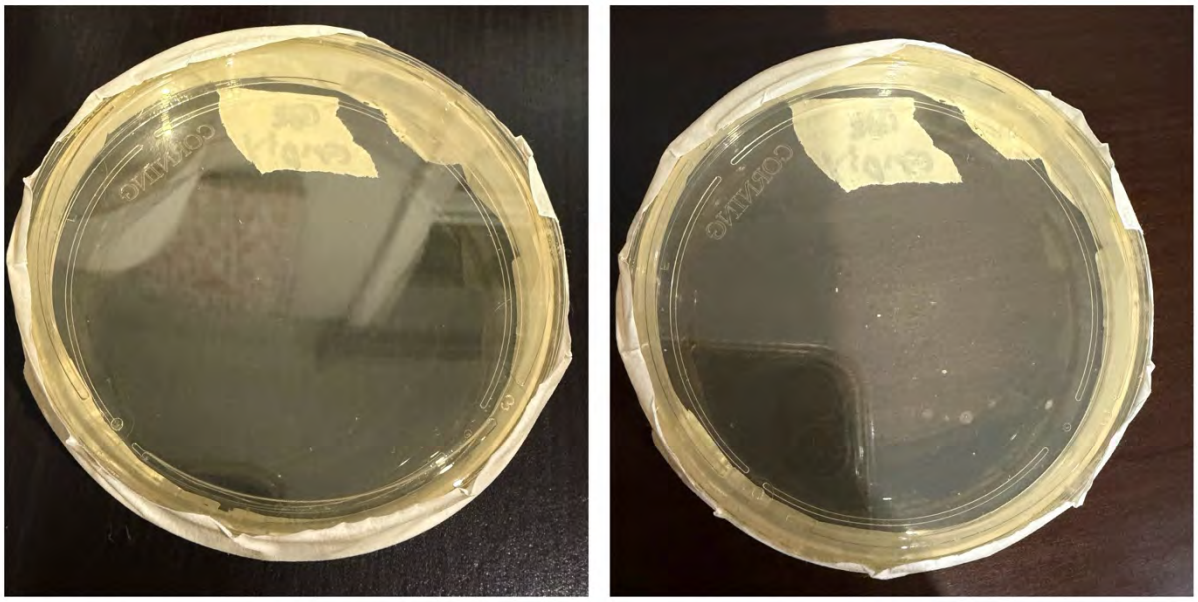

Figure 8: From day 4 (left) to day 7 (right), the empty agar plates showed no evidence of bacteria or mold, which was evidence that the growth seen on other plates wasn't due to environmental contamination.

Plates were visually analysed for growth and colour/shape of what was growing. If fuzzy or irregularly-shaped = mold. If round and yellow/cream/white = bacteria.

Photos were analysed using an automated image-analysis script (Python + OpenCV) (Figure 9) that detected percent of agar covered:

$$\% \text{ Covered} = [\text{Area of red + yellow labels/Total area}] * 100$$

The empty plate was the control (0%) and all other plates were reported relative to this value.

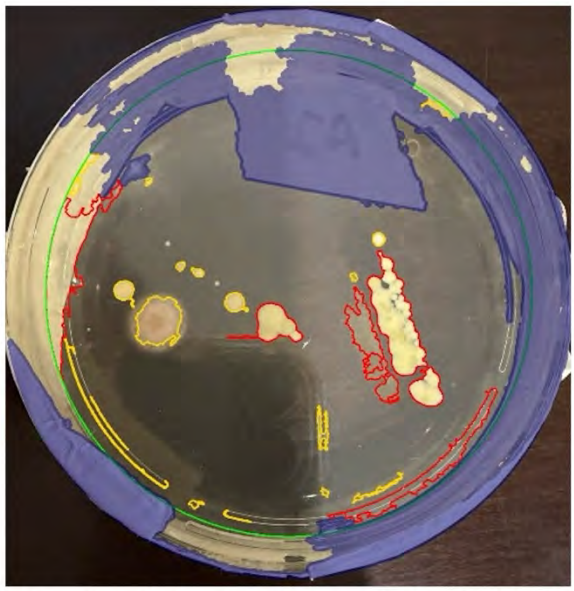

Figure 9: Example of how the automatic image analysis program calculated the % of the agar plate covered. The program analysed everything within the green circle. Blue indicates areas automatically masked out and removed from the analysis. Yellow indicates bacteria. Red indicates mold.

Table 1: Analysis of agar plates on Day 7 using visual inspection (amount of growth and colour/shape of what is growing) and an automated image-analysis program (% of ager covered relative to empty control).

Plate	Percent of agar covered (%)	Amount of growth	Colour/shape of what is growing	Mold, bacteria or mixed
Empty (control)	0%	None	Clear agar- no clear growth	No evidence of bacteria or mold
Toilet Samples				
A1: Toilet 1	5.6%	Low	Small, round yellow colonies	Bacteria
A2: Toilet 2	7.7%	Moderate	Yellow lines of small, round colonies; large, round cream colony; pinkish-brown fuzzy circle	Mixed- mostly bacteria, with one circle of mold
Mobile Phone Samples (Before disinfection)				
B1: Phone 1 (pre-cleaning)	6.1%	Moderate	Two large, white irregularly-shaped groups (like tree branches); two medium-sized fuzzy round spots with dark brown centres; some small, yellow circles	Mixed- mostly mold, with some bacteria
B2: Phone 2 (pre-cleaning)	7.3%	Low-moderate	Small, round yellow colonies plus one large brown, fuzzy circle with a darker brown centre	Mixed- mostly bacteria, with one circle of mold
B3: Phone 3 (pre-cleaning)	22.2%	High	Large, white irregularly-shaped blob; one large brown, fuzzy cicrcle with a darker brown centre; yellow, irregularly-shaped line; lots of large, round cream colonies	Mixed- bacteria and mold
B4: Phone 4 (pre-cleaning)	1.3%	Low	A few small, round yellow colonies	Bacteria
Mobile phone samples (After UV disinfection)				
C1: Phone 1 (post-cleaning with UV)	2.1%	Very Low	Very few small, round white dots around edges	Bacteria (but not much)

C2: Phone 2 (post-cleaning with UV)	4.9%	Very Low	A few white dots and two larger white, fuzzy circles	Mixed-bacteria and mold (but not much of either)
Mobile phone samples (After antibacterial wipe disinfection)				
D1: Phone 3 (post-cleaning with wipe)	0%	None	Almost clear agar, maybe one small, round cream speck	Bacteria (essentially none)
D2: Phone 4 (post-cleaning with wipe)	2.4%	Very Low	Scattered small yellow specks	Bacteria

Table 2: Average percent of agar covered per group

Group	**Average % agar covered (Sum of % agar across all plates in group/ # of plates in**
Empty	**0%** (control)
Toilet Samples	(5.6%+7.7%)/2 *100 = **6.65%**
Mobile Phone Samples (Pre-Disinfecting)	(6.1%+7.3%+22.2%+1.3%)/4 *100 = **9.23%**
Mobile Phone Samples (Post-UV Disinfecting)	(2.1%+4.9%)/2 *100= **3.5%**
Mobile Phone Samples (Post-Antibacterial Wipe Disinfecting)	(0%+ 2.4%)/2 *100 = **1.2%**

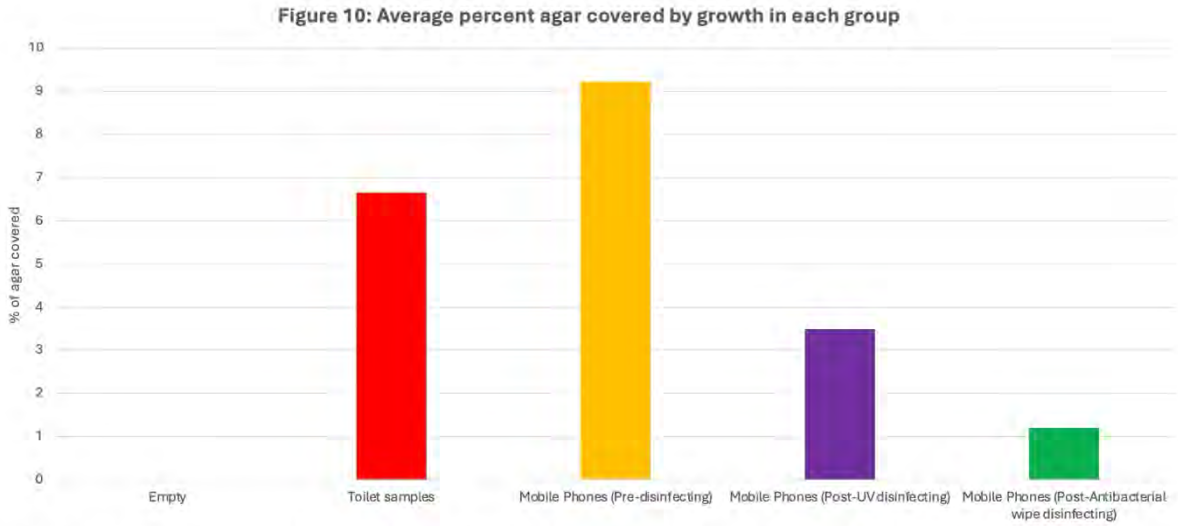

Figure 10: The average percent agar covered by growth in each group. The mobile phones pre-disinfecting had the highest percentage of agar covered by growth (9.23%). The mobile phones post-disinfecting with an antibacterial wipe had the lowest percentage of agar covered by growth (1.2%).

Evaluating (234 words):

My hypotheses were supported. Before disinfecting, mobile phones were dirtier than public toilets (9.23% vs. 6.65% surface covered), with bacteria and mold on three out of four phones. Toilets had mostly bacteria and much less growth. This might be because toilets are regularly cleaned, but participants admitted to not cleaning their phones often. This supports past research showing phones harbour many different bacteria, including E coli. I unfortunately couldn't identify bacteria because this requires more tests, like gram stains or genetic testing, which I couldn't do. This would be interesting future research.

Disinfecting phones with UV or antibacterial wipes both significantly reduced (but didn't eliminate) bacteria/mold growth. Antibacterial wipes (1.2%) were a little more effective than UV (3.5%), maybe because antibacterial wipes physically kill germs,[10] while UV sterilisation only removes germs that it touches- missing edges of phone cases or charging ports.[11] UV, however, may be safer for phones long-term, since it doesn't affect phone coatings.[11]

One limitation was that because bacterial growth took a long time at room temperature, plates started to dry out. Another limitation was that overall growth was low. My toilets/phones might have been too clean, or I might need to use wet swabs to collect more germs when sampling.

From my study, I hope that people will learn to avoid bringing their phones on toilet breaks and clean them often to prevent getting sick from germs on their surfaces.

Word Count: 995*

**Note: Total count does not include title, headings, figure captions, tables, acknowledgements/assistance, AI declaration or references.*

Acknowledgments and Assistance:

Thank you to Associate Professor Tania Crotti for providing the LB agar powder for my experiment. Thank you to Ms Katja Bier for providing advice on my risk assessment. Thank you to my participants for trusting me with their phones.

My mother helped me to make up the agar plates and wrote the code for the automated image analysis script using Python and OpenCV. She also helped me to format and proofread my report and showed me how to make my results table and figures (including using BioRender to create my methods figure).

AI Declaration:

No AI tools were used in the preparation of this entry.

References:

1. "*Are we aware how contaminated our mobile phones with nosocomial pathogens?"* Fatima Ulger and colleagues, *Annals of Clinical Microbiology and Antimicrobials* (2009): https://pmc.ncbi.nlm.nih.gov/articles/PMC2655280/ Accessed 23 May 2026.

2. "*Are mobile phones really 10 times dirtier than toilet seats?"* Science ABC: https://www.scienceabc.com/eyeopeners/are-mobile-phones-really-10-times-dirtier-than-toilet-seats Accessed 9 May 2026.

3. *"The dirty truth: Our mobile phones are crawling with bacteria."* Southern Phone: https://www.southernphone.com.au/blog/the-dirty-truth-our-mobile-phones-are-crawling-with-bacteria . Accessed 16 May 2026.

4. "*Keeping your phone clean can help prevent you from getting sick."* Indiana University School of Medicine: https://medicine.iu.edu/blogs/indiana-health/germs-that-live-on-your-phones Accessed 16 May 2026.

5. "*One in six mobile phones contain E coli"* The Guardian: https://www.theguardian.com/world/2011/oct/13/mobile-phones-uk-e-coli Accessed 19 June 2026.

6. "*Americans check their phones 80 times a day: A study"* The New York Post: https://nypost.com/2017/11/08/americans-check-their-phones-80-times-a-day-study/ Accessed 19 June 2026.

7. *"Our mobile phones are covered in bacteria and viruses…and we never wash them"* The Conversation: https://theconversation.com/watch-our-mobile-phones-are-covered-in-bacteria-and-viruses-and-we-never-wash-them-167784 Accessed 9 May 2026.

8. *"How often should office restrooms be cleaned? Australian standards explained."* Clean Group: https://commercialcleaning.au/cleaning-restroom-frequency-standards-for-office-australia/ Accessed 19 June 2026.

9. "*Agar preparation without an autoclave: Standard operating procedure"* GrowNectGen: https://grownextgen.org/media/pages/curriculum/soy-fresh-soy-clean/student-lab-preparation/7683735603-1771612800/agar-preparation-without-autoclave.pdf Accessed 16 June 2026.

10. *"How do antibacterial wipes kill viruses and bacteria"* Uniwipe: https://uniwipe.com/how-do-antibacterial-wipes-kill-viruses-and-bacteria/ Accessed May 30, 2026

11. *"Understanding UV phone sanitisers"* ZAGG: https://www.zagg.com/blog/do-uv-phone-sanitizers-work Accessed May 30, 2026.

Note: This list includes only references directly included in my report. For all references read as part of this project, please see my log and notes.

Would you put your face on a toilet? Investigating bacteria on mobile phones

By: Alexander Praino

Pembroke School, Year 3

Log and Research Notes:

In this log, I will talk about my research and how I did my study. I will share my notes on my research and the references that I looked at as part of my research.

Research Notes:

Wednesday, 15th April

I have been thinking about what I want to do for my Scientific Inquiry project. I am very interested in biology, so I know that I want to do something in biology. I read that mobile phones are dirtier than toilets, so I want to see if this is true. I talk to my mother about this, and she says that this type of biology is called microbiology. I look up what microbiology means and find a page from the Microbiology Society that says that microbiology is the study of microbes, which are organisms too small to see with the naked eye, like bacteria, viruses, fungi, protozoa and more.[1] Microbes that can make you sick are called pathogens. This seems like something really interesting to study.

1. "*What is microbiology?"* Microbiology Society: https://microbiologysociety.org/why-microbiology-matters/what-is-microbiology.html Accessed 15 April, 2026.

Friday, 17th April

I know that I want to study whether mobile phones are dirtier than toilets, but I also want to see if you can clean them to reduce the number of germs on them. I'm not sure how to see what types of bacteria are growing on the phone. I do some research and find that you can actually grow bacteria in plastic dishes called Petri dishes. You have to fill the Petri dishes with something called agar. I do some research about agar and find out that it comes from red algae. When you mix it with water, it makes a kind of gel that microbes, like bacteria and fungi, can grow on[2]. Since it's clear, it's easy to see the colonies, or groups of bacteria, that grow on its surface. I start to look at where I can get agar. It turns out you can buy agar-agar powder in your local supermarket!

2. *"What is agar and why is it used in microbiology?"* Gino Biotech: https://ginobiotech.com/what-is-agar-and-why-is-it-used-in-microbiology/ Accessed 17 April, 2026.

Saturday, 18th April

My mother told me that I cannot grow bacteria using just agar-agar. She said that agar provides the surface for the bacteria to grow on, but that bacteria don't eat the agar-agar. They need "food" to actually grow. I researched this and found out that this is true. Bacteria need things like sugar and amino acids to grow. I found a video[3] and some recipes[4,5] online for how to make homemade agar plates at home using agar-agar, water, sugar and beef bouillon cubes.

3. *"Grow Bacteria at home- with Kelsy"* YouTube: https://www.youtube.com/watch?v=fEtr2HAn6q4 Accessed 18 April, 2026.

4. *"Homemade agar plates."* University of East Anglia: https://assets.uea.ac.uk/f/185167/dfe778726a/plants-and-pests-homemade-agar-plates.pdf Accessed 18 April, 2026.

5. *"Homemade Petri Plates- Microbial Zoos."* The Kitchen Pantry Scientist: https://kitchenpantryscientist.com/microbial-zoos-homemade-petri-plates/ Accessed 18 April, 2026.

Saturday, 25th April

I have been reading about how germs are spread. I have learned that they can be spread through: 1) direct contact, like shaking hands, hugging or high fiving someone who is infected, 2) indirect contact, by touching a surface contaminated with germs and then touching your eyes, nose or mouth or 3) the air, when an infected person coughs or sneezes (germs can travel as far as 6 feet!). I learned that germs are especially dangerous for people with weaker immune systems, like cystic fibrosus[6]. I really liked watching a video by Mark Rober on how glowing germs can spread.[7]

6. "*What you should know about germs"* The Cystic Fibrosis Foundation: https://www.childrenshospital.org/sites/default/files/2025-11/cystic-fibrosis-ed-germ-facts.pdf Accessed 25 April, 2026

7. *"How to see germs spread"* Mark Rober: https://www.facebook.com/MarkRoberYouTube/videos/216989136214688/ 25 April, 2026

Saturday, 2nd May

I have been reading about the different types of germs. There are four different types of germs: bacteria, viruses, protozoa and fungi[8].

- Not all bacteria are bad. Some live in our bodies and keep us healthy, like the ones in our digestive system. Other bacteria can make us sick.
- Viruses aren't cells. They need a living host cell, like your body, to reproduce and this makes you sick. Antibiotics don't work against viruses.
- Fungi are plant-like organisms made up of more than one cell. Some live in the soil in the environment, like mushrooms. Others, called commensal fungi, can live in our body, like in our digestive system, without causing harm. I didn't know what the word "commensal" meant, but found out that it's a type of relationship where one organism

benefits and the other isn't helped or harmed. Common fungal infections, like athlete's foot, don't usually cause harm to people if they are otherwise healthy.
- Protozoa are one-celled organisms. They like moisture and can spread through contaminated water. Some are parasites, like malaria, which lives inside red blood cells.

Germs were discovered by Antonie van Leeuwenhoek in 1676. Lous Pasteur was the first to show that food spoiled because of contamination by microbes. This led to the germ theory of disease. This was the first theory to say that germs called pathogens lead to infection and disease.

Germs can live on surfaces for minutes to months, depending on the germ, environment, type of surface and amount of germ on the surface.

8. *"Germs."* The Cleveland Clinic: https://my.clevelandclinic.org/health/articles/24495-germs Accessed 02 May 2026.

Saturday, 9th May

Today I did some reading about what is known about what germs live on a cell phone. There has been a lot of research so far on this topic, including looking at the phones of healthcare workers and students. An Australian researcher named Lotti Tajouri has done a lot of research and has found that healthcare workers, even those who work with sick children, regularly report that they use their phone in the bathroom and that they don't clean their phone ever. Yuck! I was surprised because I would think that doctors would know better, especially because 98% of them in Dr Tajouri's study said that they knew that their phones were probably contaminated.[9]

I also found some other great facts on this topic, like the fact that some mobile phones have 10 times more microbes per square inch than everyday toilets. This is because toilets are cleaned regularly, but phones are not. Phones also have warmer surfaces than toilets, so germs like breeding there. A 2017 study by the University of Arizona found that smartphones are "reservoirs of bacterial contamination."[11]

9. *"Our mobile phones are covered in bacteria and viruses…and we never wash them"* The Conversation: https://theconversation.com/watch-our-mobile-phones-are-covered-in-bacteria-and-viruses-and-we-never-wash-them-167784 Accessed 9th May 2026.

10. "*Are mobile phones really 10 times dirtier than toilet seats?"* Science ABC: https://www.scienceabc.com/eyeopeners/are-mobile-phones-really-10-times-dirtier-than-toilet-seats Accessed 9 May 2026.

11. *"Is your smartphone dirtier than a toilet? Science says yes…"* Harvard Undergraduate Microbiology Society via Medium: https://medium.com/@harvardmicrosociety/is-your-smartphone-dirtier-than-a-toilet-seat-science-says-yes-6ef5bac1a5b6 Accessed 9 May 2026.

Saturday, 16th May

I kept reading about the types of germs found on mobile phones. Studies have found all kinds of bacteria on mobile phones, such as Staphylococcus aureus, Streptococcus, E. coli and Candida species.[11,12] A 2020 review of 56 studies from 24 countries by Dr Tajouri from Bond University found bacteria reported in 54 out of 56 studies, with many different bacteria found. Two of the most common were Staphylococcus aureus and E. coli.[13]

12. "*Keeping your phone clean can help prevent you from getting sick."* Indiana University School of Medicine: https://medicine.iu.edu/blogs/indiana-health/germs-that-live-on-your-phones Accessed 16 May 2026.

13. *"Mobile phones represent a pathway for microbial transmission: A scoping review."* Matthew Olsen and colleagues, *Travel Medicine and Infectious Disease* (2020): https://pmc.ncbi.nlm.nih.gov/articles/PMC7187827/ Accessed 16 May 2026

Saturday, 23rd May

Today I focused on learning more about how germs spread from our hands to surfaces and from surfaces to our hands. I learned that every time we touch something, like a door handle, we pick up microbes. When we touch our phone without washing our hands first, these microbes transfer onto our phone screens.[10] If you use your phone in the toilet, this gets worse because toilets release lots of germs into the air when they are flushed.

I found an article that quoted Professor Charles Gerba from the University of Arizona who said that: "*nobody ever cleans or disinfects their phone, so the germs and bacteria just keep building up…with the advent of touch-screen phones, the same part of the phone you touch with your fingertips is pressed right up against your face and mouth, upping your chances of infection*."[14] Professor Gerba talked about a study of 200 phones that showed that 94.5% of them were contaminated with some kind of bacteria, some of which were antibiotic resistant.[15] They also tested people's hands and showed that they had many of the same bacteria as the phones, so it was likely that the bacteria from the hands ended up on the phones and vice-versa. Once on the hands, people could transfer these bacteria into their body by touching their eyes or nose.

14. "*Your mobile phone is dirtier than you think."* 2Ascribe: https://www.2ascribe.com/articles/health-wellness/your-mobile-phone-is-dirtier-than-you-think Accessed 23 May 2026

15. *Are we aware how contaminated our mobile phones with nosocomial pathogens?"* Fatima Ulger and colleagues, *Annals of Clinical Microbiology and Antimicrobials* (2009): https://pmc.ncbi.nlm.nih.gov/articles/PMC2655280/ Accessed 23 May 2026.

Saturday, 30th May

Today I was thinking about ways to disinfect the phones. I did some reading that germs can be killed by rubbing alcohol.[8] With rubbing alcohol, you should let it sit for 30 seconds before wiping if off. Most tech companies recommend using 70% isopropyl alcohol wipes,

but not higher, on phones, although Apple says that gentle use of both disinfecting wipes and 70% isopropyl alcohol is OK.[16] Antibacterial disinfecting wipes kills germs by using chemicals on the wipe to break down and eliminate germs.[17] To be effective, they have to be applied for the correct contact time, which can range from 15 seconds to 30 minutes and varies depending on the type of wipe and the types of bacteria or viruses that it claims to target.[17]

Another technique is the use of UV radiation. UV sanitisers use UV-C light, the shortest wavelength of ultraviolet light at 100-280 nanometres, to eliminate bacteria and viruses. [18] This technique is often used in hospital to sterilise surgical tools and surfaces. It works by being absorbed by the DNA of microbes, which kills them or makes it so that they can't reproduce or function. Studies have shown that they can kill up to 99.9% of harmful bacteria, including E. coli and staphylococcus, in just 5 minutes. [18] Other techniques, like using vinegar, are not recommended because they might damage the coating of the phone.[16]

I decided to try two different techniques to kill the bacteria on the mobile phones that I test: antibacterial wipes and a HomeSoap phone steriliser, which uses UB-C.

16. *"Your phone is covered in germs: A tech expert explains how to clean it without doing damage"* The Conversation: https://theconversation.com/your-phone-is-covered-in-germs-a-tech-expert-explains-how-to-clean-it-without-doing-damage-259908 Accessed 30 May 2026.

17. *"How do antibacterial wipes kill viruses and bacteria"* Uniwipe: https://uniwipe.com/how-do-antibacterial-wipes-kill-viruses-and-bacteria/ Accessed May 30, 2026

18. *"Understanding UV phone sanitisers"* ZAGG: https://www.zagg.com/blog/do-uv-phone-sanitizers-work Accessed May 30, 2026

Experiment Log:

Wednesday, 3rd June

Today I designed my experiment. I want to have two agar plates with samples from two different public toilets. I also want to have samples from at least four different mobile phones. Half of these will get wiped down with an antibacterial wipe and half of these will go into the UV-C steriliser for 10 minutes. I am using 10 minutes because that's the standard time of the HomeSoap. When you open the door, put the phone inside and close the door, it automatically starts the UV-C light for 10 minutes and you can't adjust this. After I finish the disinfecting of each phone, I will swab it again. I want to test more than one phone in each group and I want to compare the same phone to itself before and after cleaning because I think that there might be differences between people's phones with how clean they are. Otherwise, it could look like the wiping or the UV-C worked, but it might just be because that phone was cleaner than the non-disinfected phone. This also means that I don't have to find as many phones to test.

I will rub each swab onto an agar plate and then turn it upside down, so that condensation on the lid doesn't ruin my culture (I read that this is important to do). I read that the bacteria will grow faster around 37 degrees Celsius, which is similar to human body temperature, but I do not have a way to keep my plates at this temperature, since I do not have an incubator. Instead, I will grow my plates in a dark place at room temperature. I expect to see bacteria in 3 days, but it might take up to 7 days for them to fully grow.[19] I decide that I will do my final check and analysis of my plates after 7 days, but I will photograph my plates every day starting at 4 days.

My mother showed me how to use a program called BioRender to make a picture showing my experimental design. It looks really cool and the program even had a toilet icon!

19. "*Grow bacteria on homemade agar plates."* Science First: https://www.sciencefirst.com.au/science-extra/post/grow-bacteria-on-homemade-agar-plates Accessed 3 June, 2026

Wednesday, 10th June

Today I worked on my risk assessment for the project. Since I am making the agar plates and growing bacteria myself, there are lots of important things to consider to make sure that I can perform the experiment safely. After talking about it with my mother, we agree that it's probably best that I do the experiment in a science lab, rather than at home. This way, I can access all of the safety equipment that I need. We also agree that I should borrow some LB agar powder from one of her friends at work so that it already has all of the nutrients needed in the right amounts and so that it is manufactured by a company to make sure that it is high quality and safe. LB agar stand for lysogeny broth and it doesn't just have agar but also has tryptone for amino acids, yeast extract for vitamins and trace elements and sodium chloride, which is regular table salt, which helps with osmotic balance.[20] This will help my bacteria to grow better.

I also made a consent form for participants to sign. This is important because the people who are providing their mobile phones need to understand what the study is about and what they will have to do. They need to agree to be part of the study, after they understand these things.

20. *"Lysogeny broth*," Wikipedia: https://en.wikipedia.org/wiki/Lysogeny_broth Accessed 10 June, 2026

Monday, 15th June

I received some advice back about my risk assessment from Ms Bier, one of the science teachers at school. Even though I wanted to do a gram stain in some samples of the bacteria that I grow, she told me that it would be safest if I left the Petri dishes taped closed after I plated the samples. This is because even though the bacteria found on the mobile phones or toilets might not be harmful in small amounts, we don't know exactly what I'll grow and they can be harmful in the larger amounts on the Petri dish. This makes sense, so I adjust my risk assessment.

Tuesday, 16th June

Tomorrow I am making my agar plates and collecting my samples, so tonight I reviewed all of my steps so that I am ready to get started right away tomorrow.[21] I also printed out a copy of my consent form.

21. "*Agar preparation without an autoclave: Standard operating procedure"* GrowNectGen: https://grownextgen.org/media/pages/curriculum/soy-fresh-soy-clean/student-lab-preparation/7683735603-1771612800/agar-preparation-without-autoclave.pdf Accessed 16 June 2026.

Wednesday, 17th June

Today I made my agar plates. I started by wiping down the area with 70% isopropyl alcohol, so there would be no contamination. It was really fun to weigh out the LV agar powder on the fancy scientific balance and to pour it into the flask, although the flask was pretty heavy once the 500mL of distilled water was added. Once it started boiling, it boiled really fast and started to boil over, so I had to turn the heat down really quickly. I also loved using the pipette gun to draw up 20mL of the agar and pour it into each Petri dish. The first time that I filled the plates, nothing happened, even though I gave the agar almost two hours to set. I was really nervous because I didn't know what I was going to do if the agar plates didn't work!

I did some reading to try to understand what could have gone wrong. I realised that I heated the agar solution, but I didn't boil it. You have to boil the agar for it to be activated and able to gel. Once I realised this, I emptied all of my Petri dishes, rinsed them out with distilled water and started over. This time, I boiled the agar solution properly. I let it cool a little and then added 20mL to each dish. This time, it started to solidify right away! After an hour, my agar plates were ready to go!

I then went around and collected mobile phones. I explained the study to each person and had them sign the consent form. I then swabbed their phone. I had randomly selected before I started collecting samples in what order I would give the UV sterilisation or the antibacterial wipe. After I cleaned each phone by either wiping it with an antibacterial wipe or putting it into the Homesoap for 10 minutes, then I swabbed it again. After all of the phones were finished, I collected samples from two toilets in the same building as the science lab.

I took all my swabs back to the agar plates and streaked them on to the plates one at a time by rubbing each swab on its specific plate in a zig zag motion. After I added each swab to its plate, I put the lid on the plate and taped it shut and added a label with tape on the top, so that the plates wouldn't get mixed up. I turned all of the plates upside down, stacked them and stored them in a cupboard. Then I cleaned up the area with 70% isopropyl.

It's important that I wore a lab coat, gloves and goggles when making the agar plates and when plating the samples. I also wore gloves when collecting the samples. These things helped reduce my risk of getting injured or sick.

Now I have to wait for my bacteria to grow!

Thursday, 18th June

Checked my plates today, but no bacteria yet.

Friday, 19th June

Checked my plates today, and some of the phone samples from before the cleaning of the phone are starting to show some white spots. One, B3, has lots of white spots!

I started working on the "Questioning and Predicting" part of my report. I found a few more interesting references that I could use to show how often public bathrooms are cleaned in Australia and how many times a day people check their phones.

Saturday, 20th June

I'm really excited today because the agar plates from 3 out of 4 phone samples have bacteria on them, especially B3, which looks really gross. I can also see bacteria on the samples from the toilets. Interestingly, I don't really see any bacteria in the samples from the antibacterial wipes or UV radiation, but it's only day 3.

I started working on the "Planning and Conducting" part of my report. I added in lots of photos of me doing the different parts of experiment, but not collecting the swabs in the toilet!

Sunday, 21st June

Today I checked my plates again and the pattern is the same as yesterday, although there are more bacteria. I took photos of all of the plates. I also worked on adding all of the notes on my research to this log and typing up my reference section.

Monday, 22nd June

Today when I checked my plates they grew a lot compared to yesterday. Plates A1 and A2, which were the samples collected from the public toilets, had more bacteria, although still not as many as there were on plates B1-B3, which were the samples collected from the mobile phones. B3 especially had lots of bacteria colonies, which covered the whole plate! Interestingly, B4 looked almost blank with only small little white dots, which didn't look like the larger colonies in B1-B3. The plates from the samples taken from the phones treated with the UV steriliser (C1-C2) and antibacterial wipes (D1-D2) looked empty and didn't have any colonies obvious. Although, C1 seemed to have a streak around the one edge that no other plate seems to have. I took another photo of each of my plates.

Today, I thought more about what we don't know about the germs on mobile phones and how to clean them, which I think will be helpful when evaluating my results. We don't know how many germs need to be on a phone to make someone sick. Are the germs normally found on a phone enough or do they have to be in the higher concentration like found on the agar plates? We also don't know how efficient UV devices or antibacterial wipes are at killing germs specifically on mobile phones. My research is trying to help answer these questions.

Tuesday, 23rd June

Today was day 6 of growing my plates. The empty plate and the plates from the UV sterilisation and the antibacterial wipes still didn't have any growth. The plates from the toilets and from the phones before disinfecting all had clear growth, even B4 (the plate from the phone that didn't really have any bacteria before) now had a few round, yellow/cream circles. Several of the plates had growth that looked like it was spreading on the plate and that was irregularly shaped, not round like some of the other growth. These irregularly shaped growths were also different colours, like pink, brown or white, instead of the more yellow/cream-coloured circles seen on a lot of the plates. I think that this might be mold, rather than bacteria. The samples from the phones before disinfecting look like they have a lot more growth than the toilets. I photographed all of my plates.

Wednesday, 24th June

Today is the final day of growing my plates! They are starting to look much drier than they did when I first plated them. Maybe this is because they had to stay out for so long since the bacteria grew more slowly at room temperature than they would have in a warmer spot? I photographed all of my plates, which showed mostly the same pattern as yesterday, but with more of what I think is mold. Even some of the plates from the phones treated with UV or an antibacterial wipe looked like they had a little bit of mold (like C2). It's definitely good that today is the last day because the plates don't look so good! To dispose of the plates, my mother added some bleach to each Petri dish. After 10 minutes, she put them into a plastic bag and sealed it before placing it in the rubbish.

I took my last photographs and I'm really excited because now I get to analyse my data. I spend some time thinking about how I want my figures to look and my mother helps me to paste the pictures in Powerpoint and add labels. I make a table talking about how much growth there is in each plate and what colour/shape I see growing in each dish. I also make a column where I say if there is bacteria, mold or a mix within each dish. I want to make a graph showing the difference between the groups, but I'm not sure what I can graph. My mother suggests that I look at how much of the surface of each plate is covered by growth. She tells me that she can write a script using Python and Open CV that will automatically analyse the photos. I think this is a good idea!

My mother writes the code and I upload each of my photos. The program uses a green circle to know where the surface of the agar is. It adds blue spots where it removes the tape and the labels, so they don't confuse the analysis. The program then adds circles where it sees growth – yellow for the bright, round bacteria and red for the irregularly shaped, coloured mold. It can then use the areas in the red and yellow circles compared to the total area within the green circle to calculate the total percent of the surface of the agar covered in each dish. My mother tells me that it's important to not just look at these raw values, but to subtract the value of the empty control plate. This means that the % area will be calculated *relative to* the control dish, so that environmental contamination gets removed. This is pretty clever.

Now I can make the graph of the precent of the surface area covered. To do this, I first take the average of the percentages for each dish in a group. I then graph the average of each group in a bar graph using Excel.

Thursday, 25th June

Today, I finished putting all the data from my analysis in the "Processing and Analysing Data and Information" part of my report. It's so exciting to see all my data together. I also wrote the "Evaluating" part of my report, but I was a little nervous because I didn't have much space left. My mother helped me to proofread my report. I'm so happy to see it all together!

AI Declaration:

No AI tools were used in the preparation of this entry.

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1. "*What is microbiology?"* Microbiology Society: https://microbiologysociety.org/why-microbiology-matters/what-is-microbiology.html Accessed 15 April, 2026.

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4. *"Homemade agar plates."* University of East Anglia: https://assets.uea.ac.uk/f/185167/dfe778726a/plants-and-pests-homemade-agar-plates.pdf Accessed 18 April, 2026.

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6. "*What you should know about germs"* The Cystic Fibrosis Foundation: https://www.childrenshospital.org/sites/default/files/2025-11/cystic-fibrosis-ed-germ-facts.pdf Accessed 25 April, 2026

7. *"How to see germs spread"* Mark Rober: https://www.facebook.com/MarkRoberYouTube/videos/216989136214688/ 25 April, 2026

8. *"Germs."* The Cleveland Clinic: https://my.clevelandclinic.org/health/articles/24495-germs Accessed 02 May 2026.

9. *"Our mobile phones are covered in bacteria and viruses…and we never wash them"* The Conversation: https://theconversation.com/watch-our-mobile-phones-are-covered-in-bacteria-and-viruses-and-we-never-wash-them-167784 Accessed 9th May 2026.

10. "*Are mobile phones really 10 times dirtier than toilet seats?"* Science ABC: https://www.scienceabc.com/eyeopeners/are-mobile-phones-really-10-times-dirtier-than-toilet-seats Accessed 9 May 2026.

11. *"Is your smartphone dirtier than a toilet? Science says yes…"* Harvard Undergraduate Microbiology Society via Medium: https://medium.com/@harvardmicrosociety/is-your-smartphone-dirtier-than-a-toilet-seat-science-says-yes-6ef5bac1a5b6 Accessed 9 May 2026.

12. "*Keeping your phone clean can help prevent you from getting sick."* Indiana University School of Medicine: https://medicine.iu.edu/blogs/indiana-health/germs-that-live-on-your-phones Accessed 16 May 2026.

13. *"Mobile phones represent a pathway for microbial transmission: A scoping review."* Matthew Olsen and colleagues, *Travel Medicine and Infectious Disease* (2020): https://pmc.ncbi.nlm.nih.gov/articles/PMC7187827/ Accessed 16 May 2026

14. "*Your mobile phone is dirtier than you think."* 2Ascribe: https://www.2ascribe.com/articles/health-wellness/your-mobile-phone-is-dirtier-than-you-think Accessed 23 May 2026

15. *Are we aware how contaminated our mobile phones with nosocomial pathogens?"* Fatima Ulger and colleagues, *Annals of Clinical Microbiology and Antimicrobials* (2009): https://pmc.ncbi.nlm.nih.gov/articles/PMC2655280/ Accessed 23 May 2026.

16. *"Your phone is covered in germs: A tech expert explains how to clean it without doing damage"* The Conversation: https://theconversation.com/your-phone-is-covered-in-germs-a-tech-expert-explains-how-to-clean-it-without-doing-damage-259908 Accessed 30 May 2026.

17. *"How do antibacterial wipes kill viruses and bacteria"* Uniwipe: https://uniwipe.com/how-do-antibacterial-wipes-kill-viruses-and-bacteria/ Accessed May 30, 2026

18. *"Understanding UV phone sanitisers"* ZAGG: https://www.zagg.com/blog/do-uv-phone-sanitizers-work Accessed May 30, 2026

19. "*Grow bacteria on homemade agar plates."* Science First: https://www.sciencefirst.com.au/science-extra/post/grow-bacteria-on-homemade-agar-plates Accessed 3 June, 2026

20. *"Lysogeny broth*," Wikipedia: https://en.wikipedia.org/wiki/Lysogeny_broth Accessed 10 June, 2026

21. "*Agar preparation without an autoclave: Standard operating procedure"* GrowNectGen: https://grownextgen.org/media/pages/curriculum/soy-fresh-soy-clean/student-lab-preparation/7683735603-1771612800/agar-preparation-without-autoclave.pdf Accessed 16 June 2026.

Raw Data:

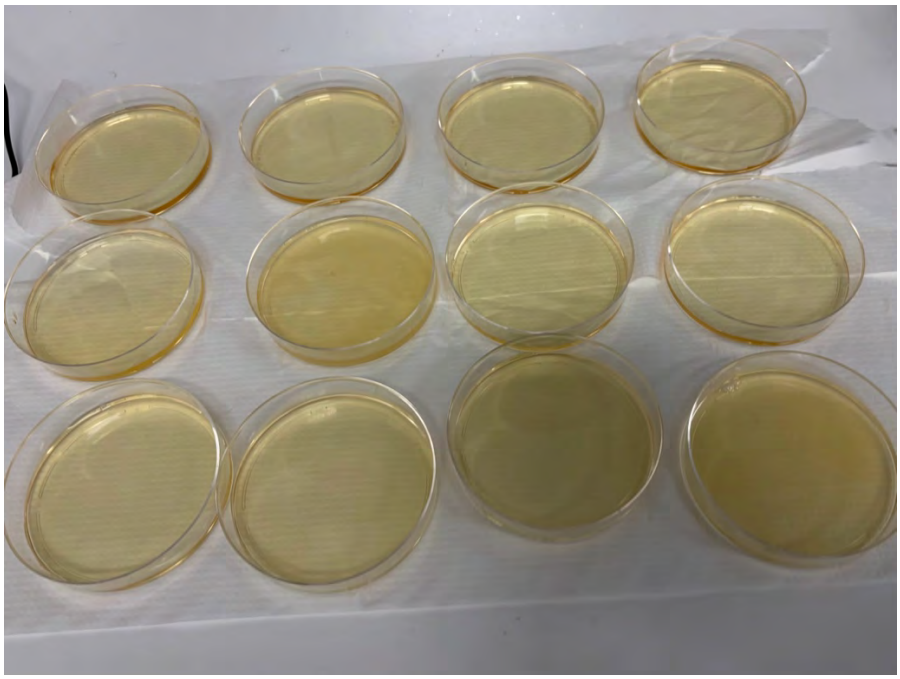
Agar plates:

When making the agar plates, I had to calculate how much LB agar powder to measure out. The bottle of LB agar powder said to weigh out 37g of the powder per litre of distilled water. Since I was only making 11 Petri dishes, I decided to make half of that. This meant that I needed to use this formula:

- 37g powder/2 = 18.5 g powder
- 1000 mL distilled water/2 = 500 mL distilled water

Day 0:

The plates when the experiment started looked like this:



The order is:

Top row, from left to right: Empty, B1, B4, D1

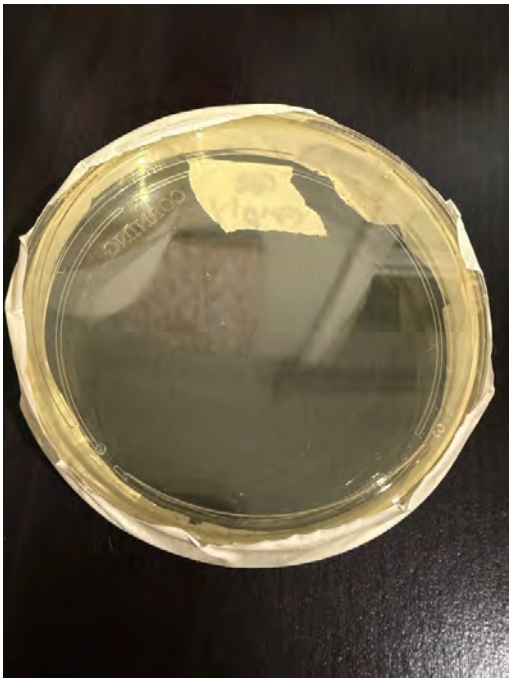
Middle row, from left to right: A1, B2, C1, D2

Bottom row, from left to right: A2, B3, C2, extra dish that I didn't end up needing

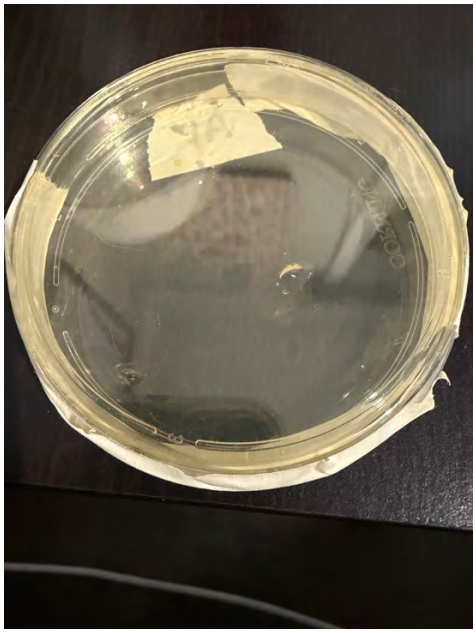
Note: In the bottom row on the far right is an extra dish that I made up, in case something happened to one of the other dishes. I didn't end up needing this, so I had 11 total dishes at the end.

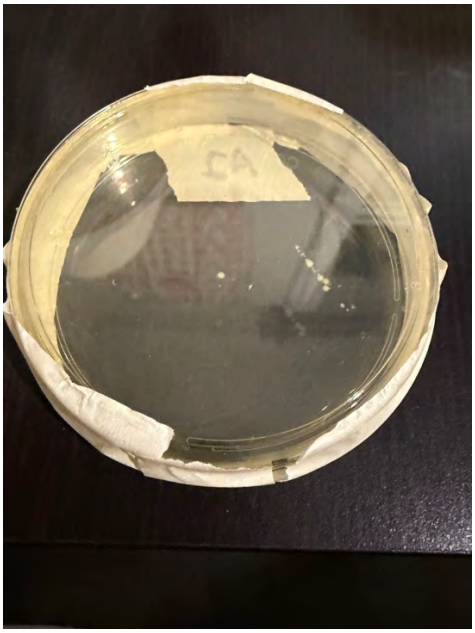
Day 4:

Empty plate:

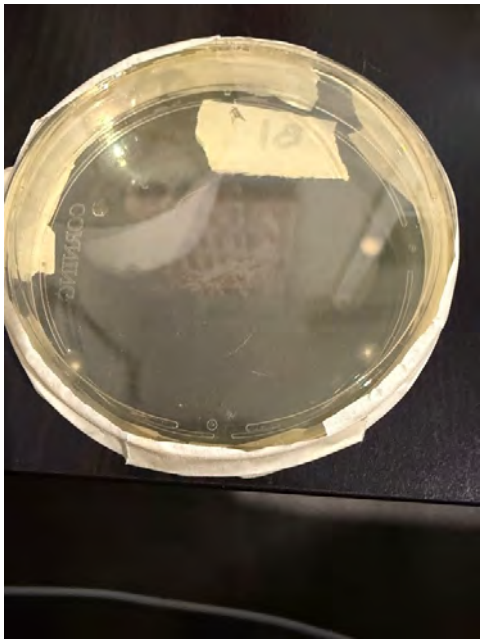


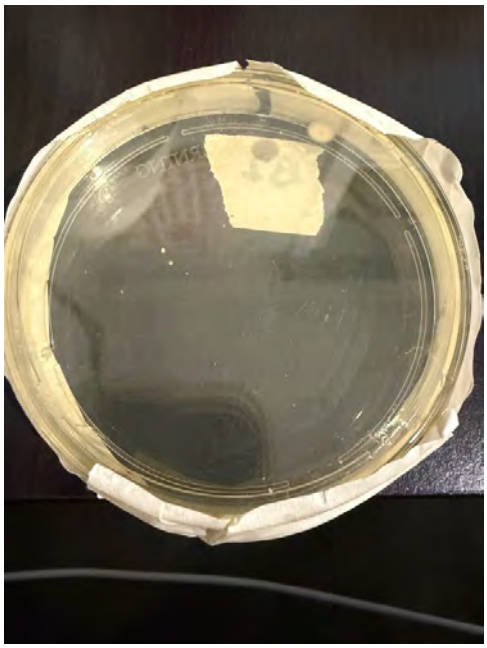
Plates with samples from the toilets (A1 on left, A2 on right):

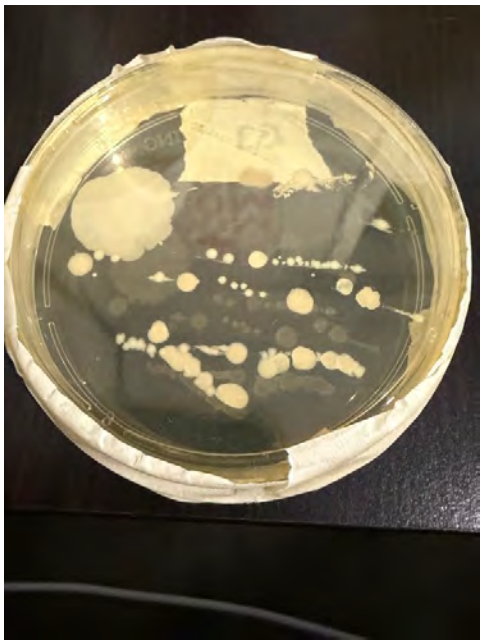


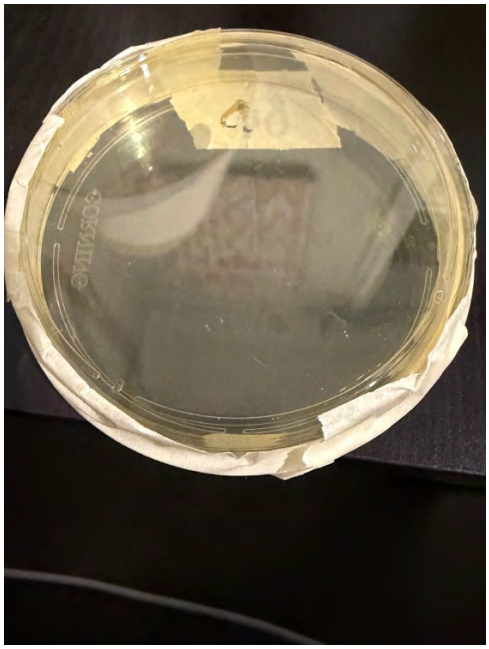


Plates with samples from the phones before cleaning (Top row: B1 on left, B2 on right; Bottom row: B3 on left, B4 on right):

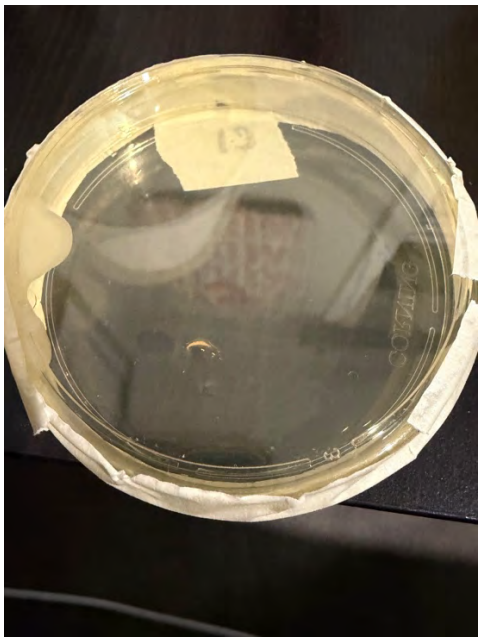


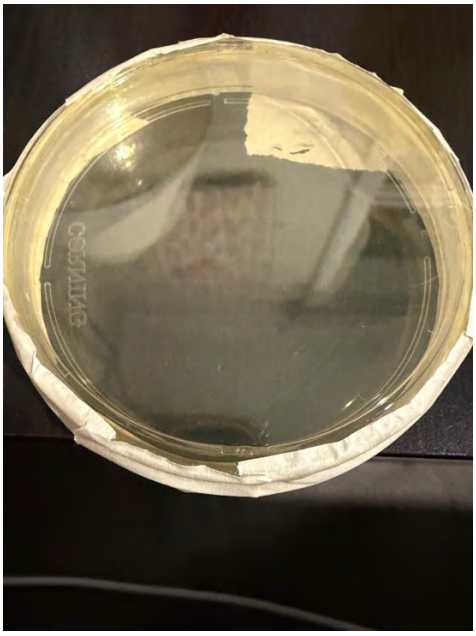




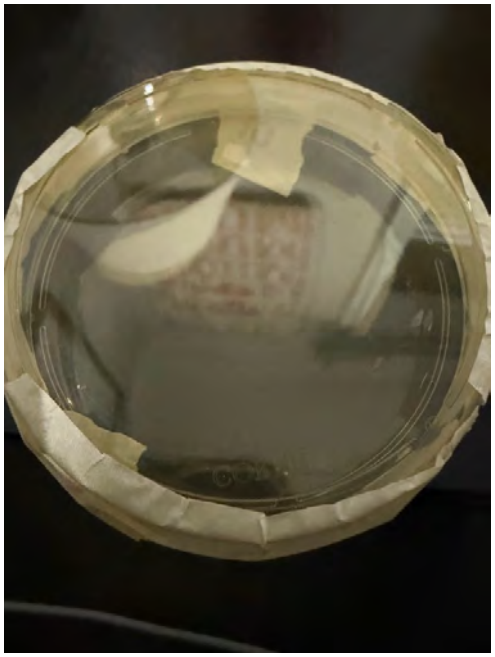


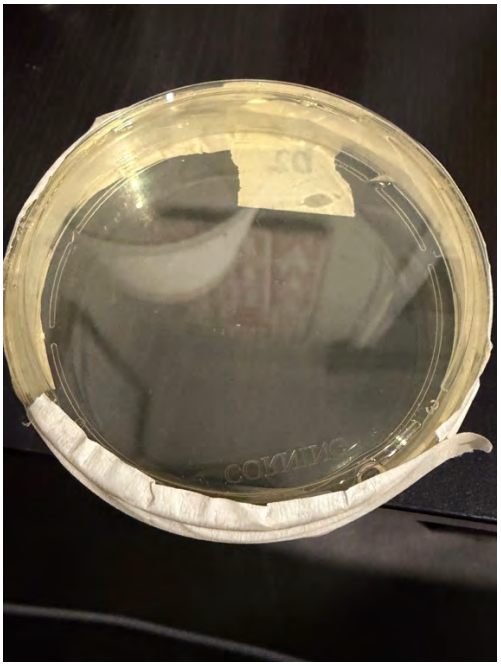
Plates with samples from the phones after UV cleaning (C1 on left, C2 on right):





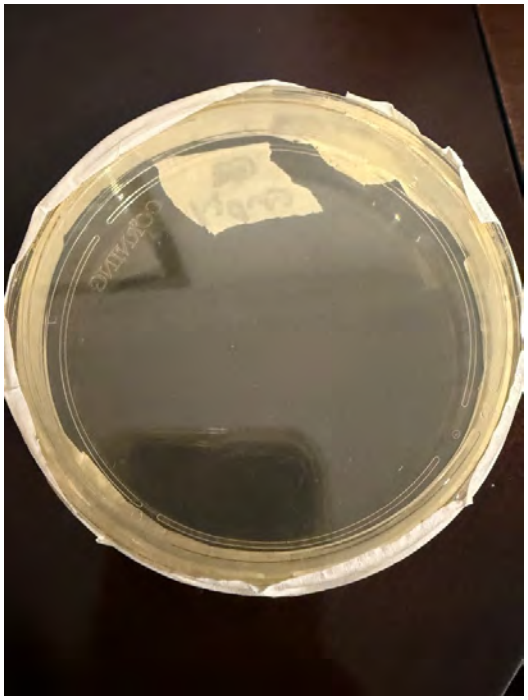
Plates with samples from the phones after antibacterial wipe cleaning (D1 on left, D2 on right):



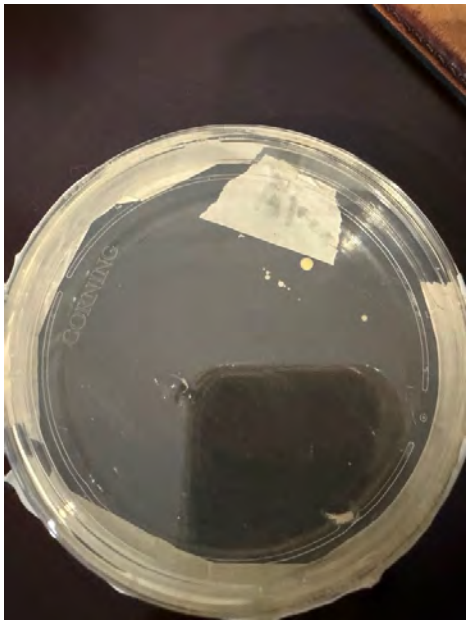


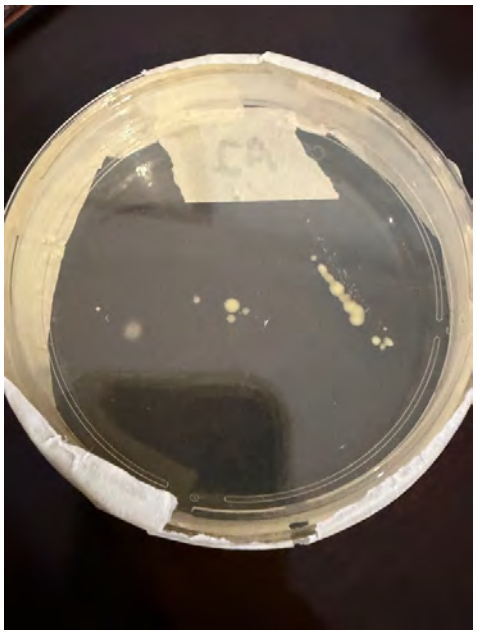
Day 5:

Empty plate:

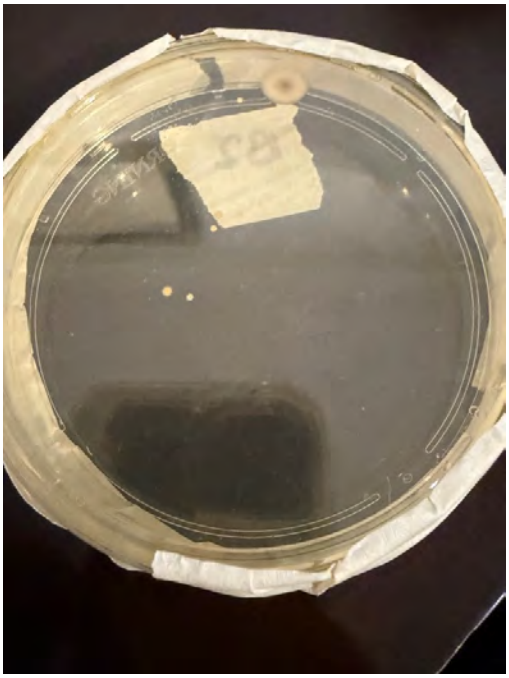


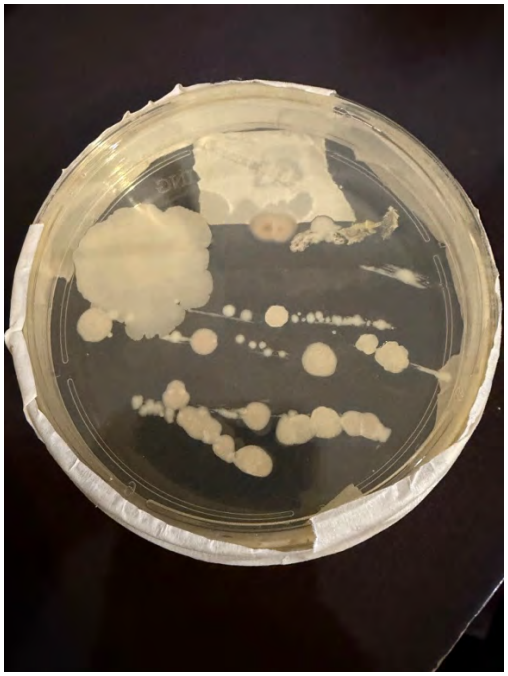
Plates with samples from the toilets (A1 on left, A2 on right):

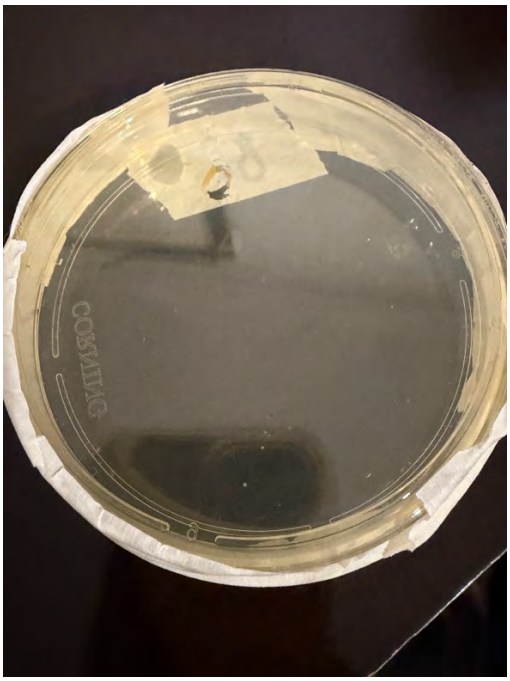




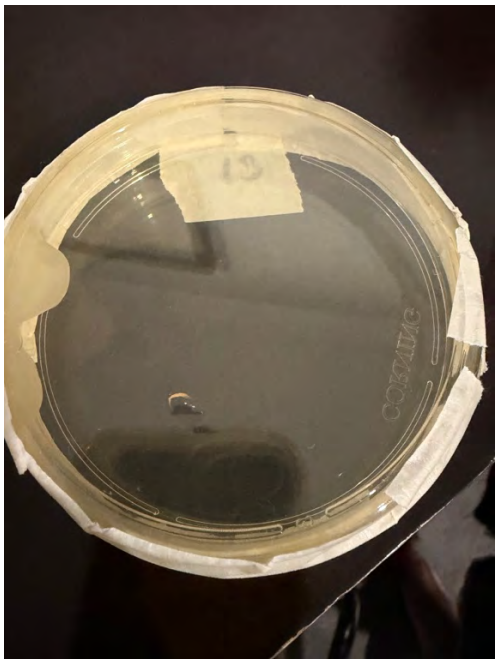
Plates with samples from the phones before cleaning (Top row: B1 on left, B2 on right; Bottom row: B3 on left, B4 on right)

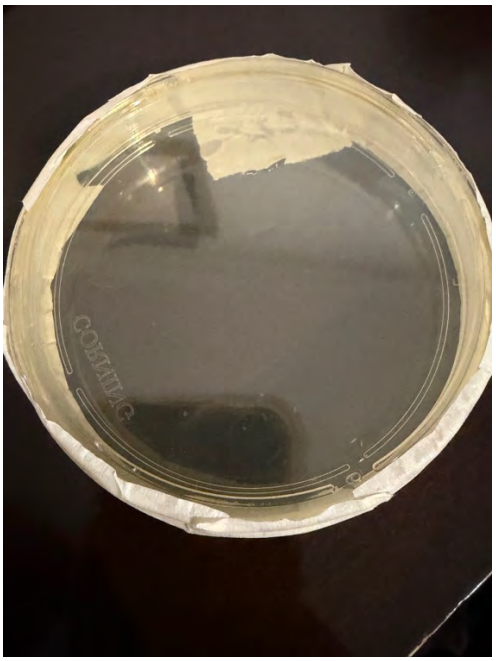




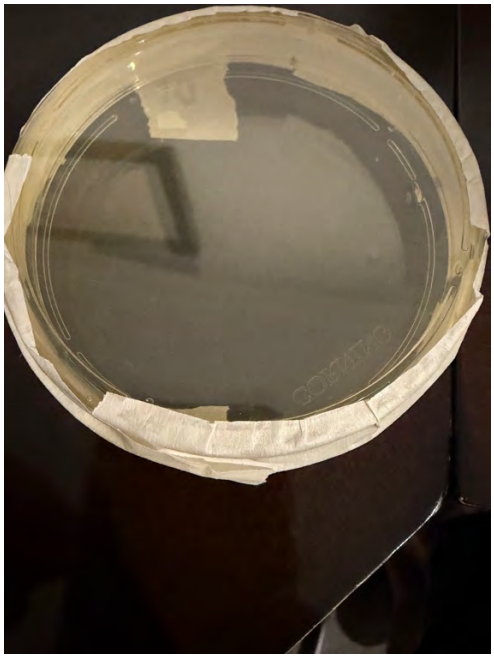


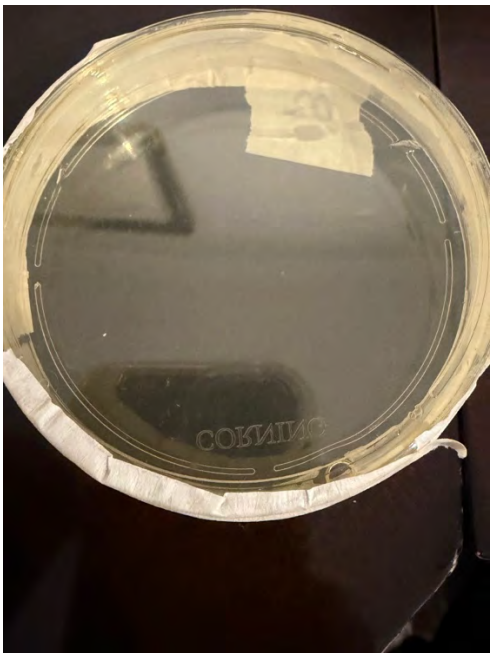
Plates with samples from the phones after UV cleaning (C1 on left, C2 on right):





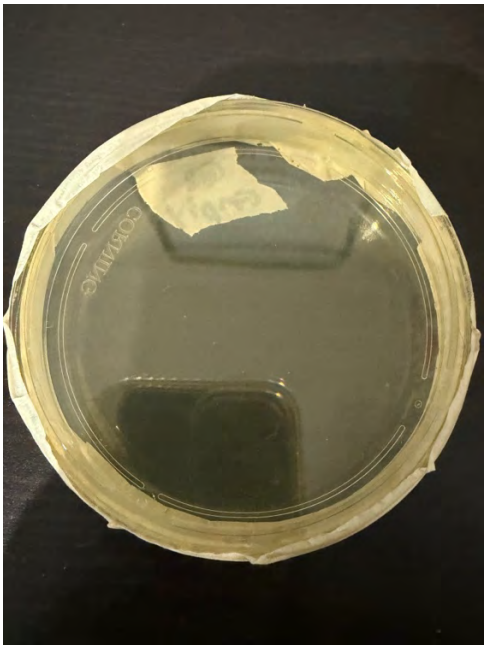
Plates with samples from the phones after antibacterial wipe cleaning (D1 on left, D2 on right):



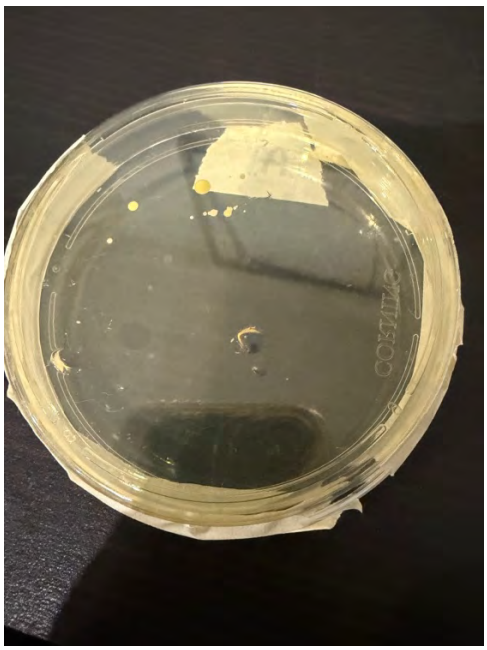


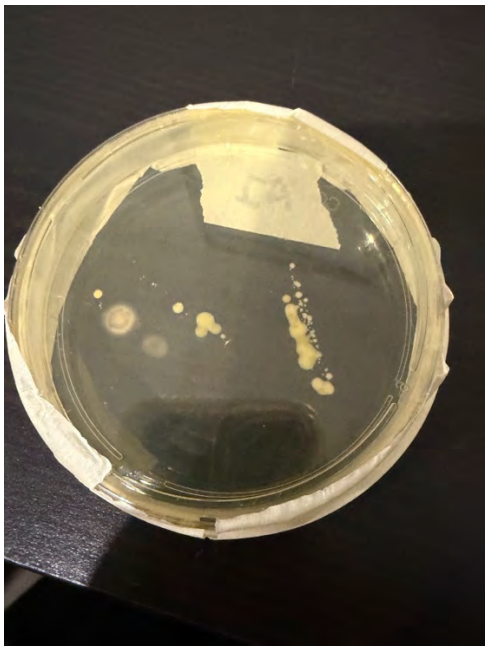
Day 6:

Empty plate:

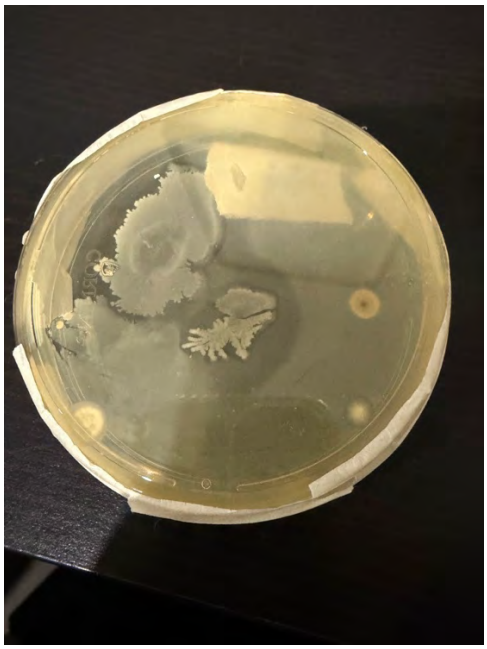


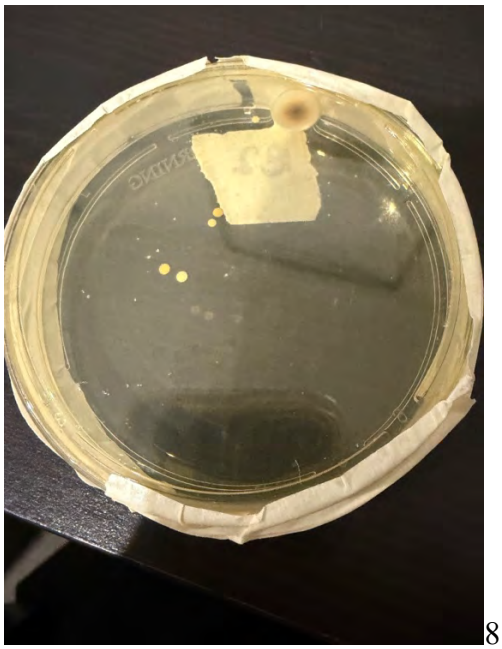
Plates with samples from the toilets (A1 on left, A2 on right):

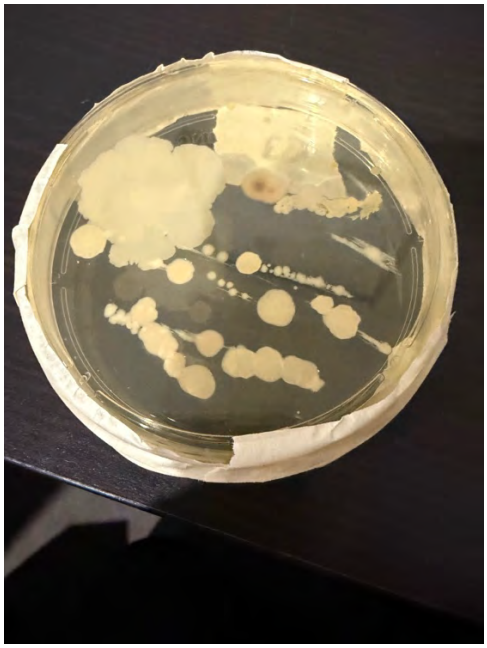


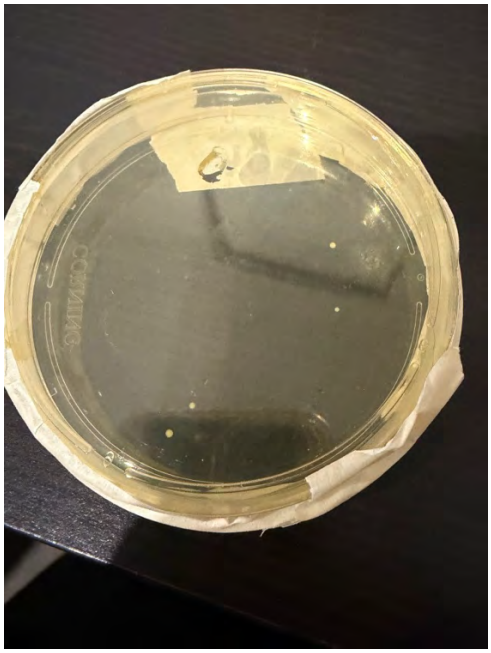


Plates with samples from the phones before cleaning (Top row: B1 on left, B2 on right; Bottom row: B3 on left, B4 on right):

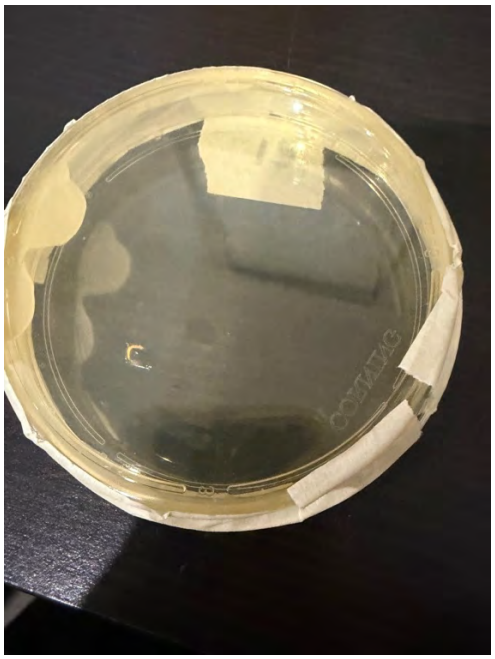
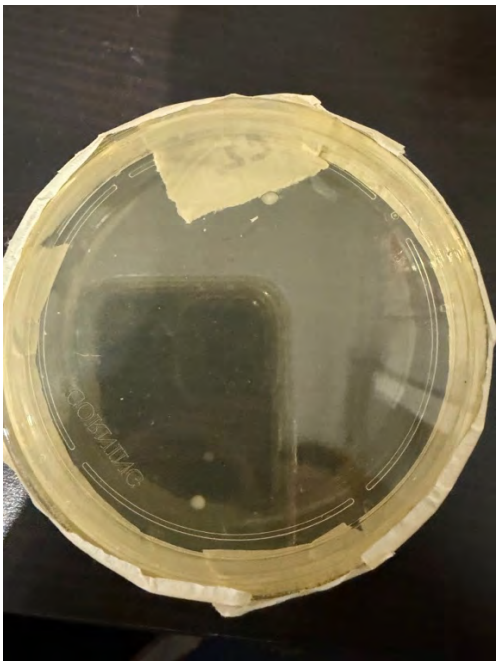




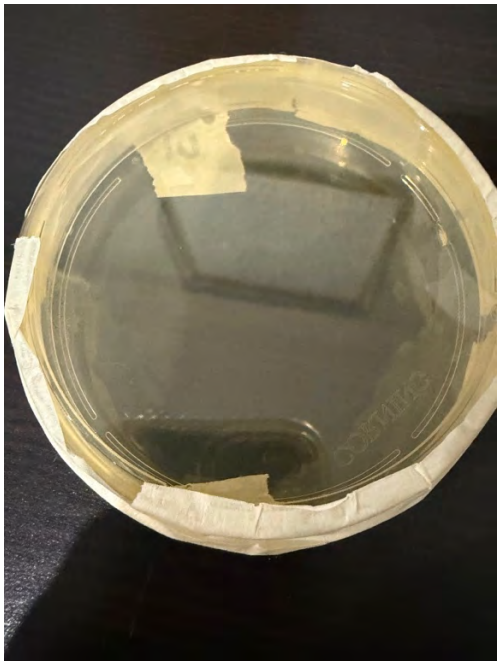
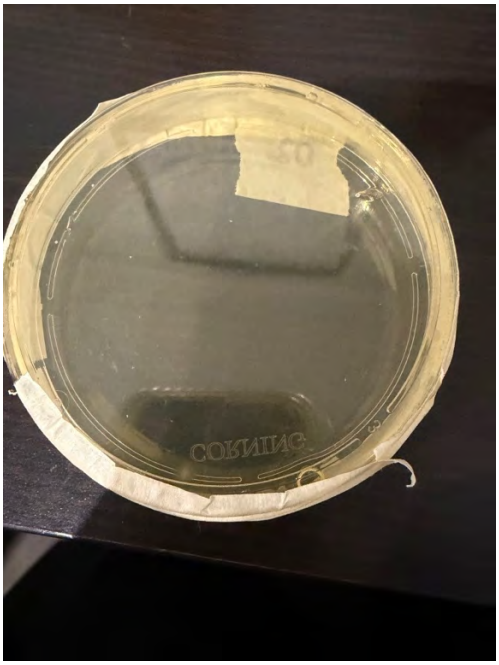




Plates with samples from the phones after UV cleaning (C1 on left, C2 on right):

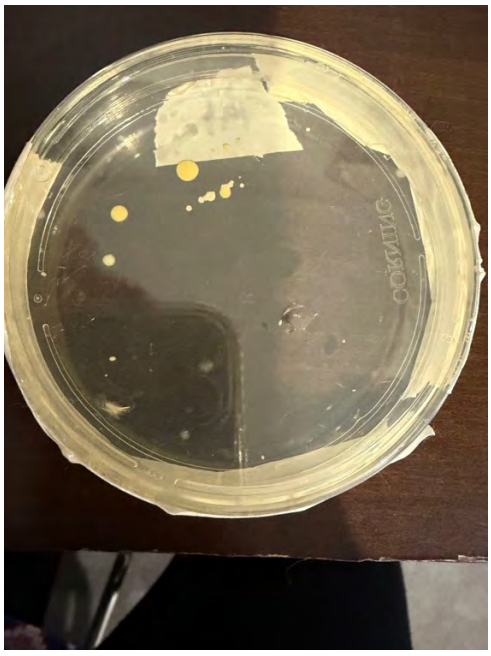
Plates with samples from the phones after antibacterial wipe cleaning (D1 on left, D2 on right):

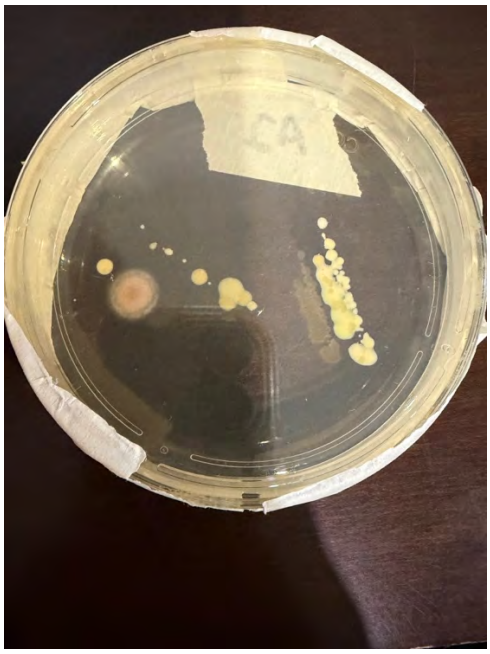



Day 7:

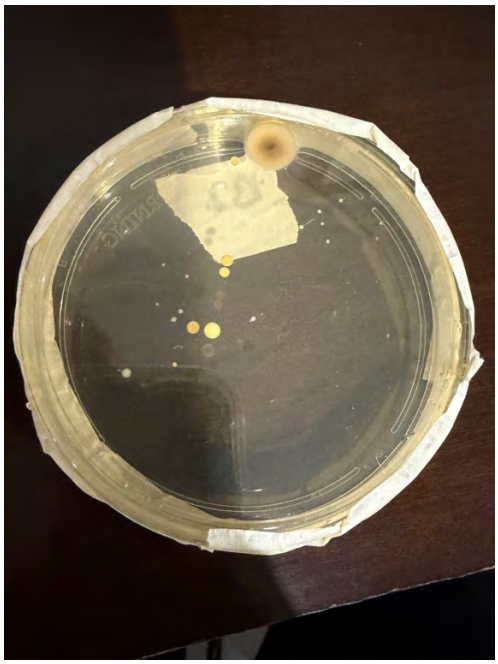
Empty plate:

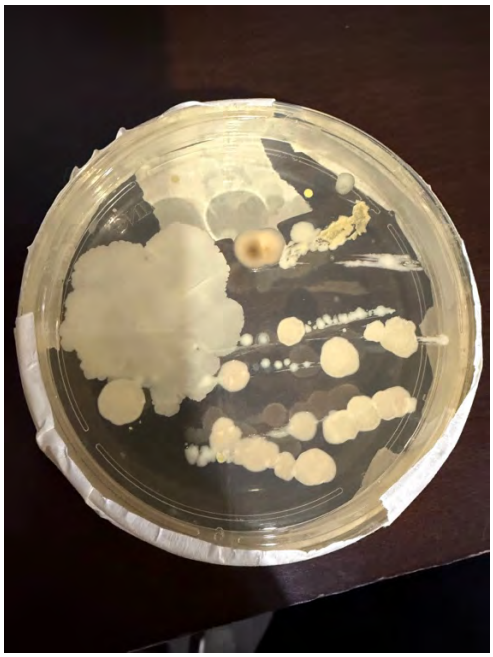
Plates with samples from the toilets (A1 on left, A2 on right):

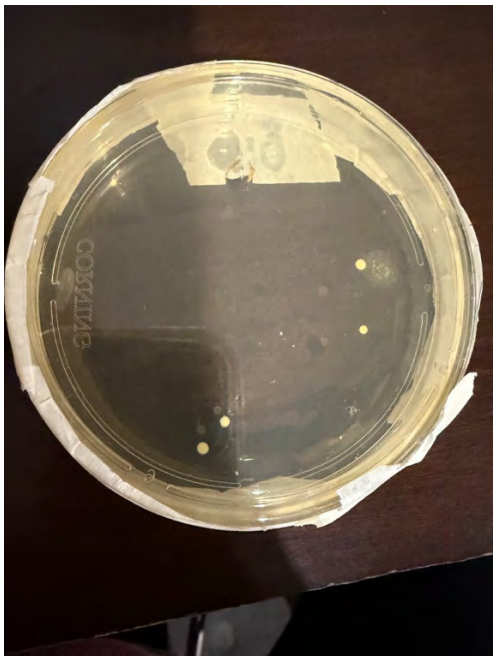




Plates with samples from the phones before cleaning (Top row: B1 on left, B2 on right; Bottom row: B3 on left, B4 on right):

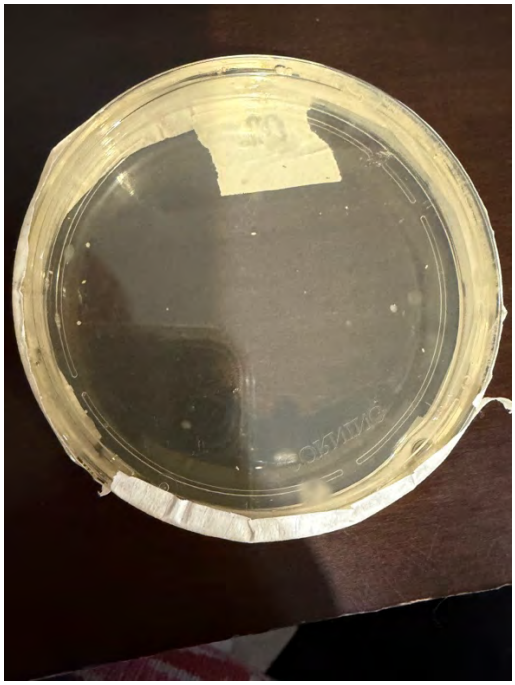






Plates with samples from the phones after UV cleaning (C1 on left, C2 on right):

Plates with samples from the phones after antibacterial wipe cleaning (D1 on left, D2 on right):



Calculation of average % agar covered per plate:

Plates were first visually inspected for how much growth was on plate and colour/shape of what was growing. I put all of this information into a table.

Table 1: Analysis of agar plates on Day 7 using visual inspection (amount of growth and colour/shape of what is growing) and an automated image-analysis program (% of ager covered relative to empty control).

Plate	Percent of agar covered (%)	Amount of growth	Colour/shape of what is growing	Mold, bacteria or mixed
Empty (control)	0%	None	Clear agar- no clear growth	No evidence of bacteria or mold
Toilet Samples				
A1: Toilet 1	5.6%	Low	Small, round yellow colonies	Bacteria
A2: Toilet 2	7.7%	Moderate	Yellow lines of small, round colonies; large, round cream colony; pinkish-brown fuzzy circle	Mixed- mostly bacteria, with one circle of mold
Mobile Phone Samples (Before disinfection)				
B1: Phone 1 (pre-cleaning)	6.1%	Moderate	Two large, white irregularly-shaped groups (like tree branches); two medium-sized fuzzy round spots with dark brown centres; some small, yellow circles	Mixed- mostly mold, with some bacteria
B2: Phone 2 (pre-cleaning)	7.3%	Low-moderate	Small, round yellow colonies plus one large brown, fuzzy circle with a darker brown centre	Mixed- mostly bacteria, with one circle of mold
B3: Phone 3 (pre-cleaning)	22.2%	High	Large, white irregularly-shaped blob; one large brown, fuzzy cicrcle with a darker brown centre; yellow, irregularly-shaped line; lots of large, round cream colonies	Mixed- bacteria and mold
B4: Phone 4 (pre-cleaning)	1.3%	Low	A few small, round yellow colonies	Bacteria

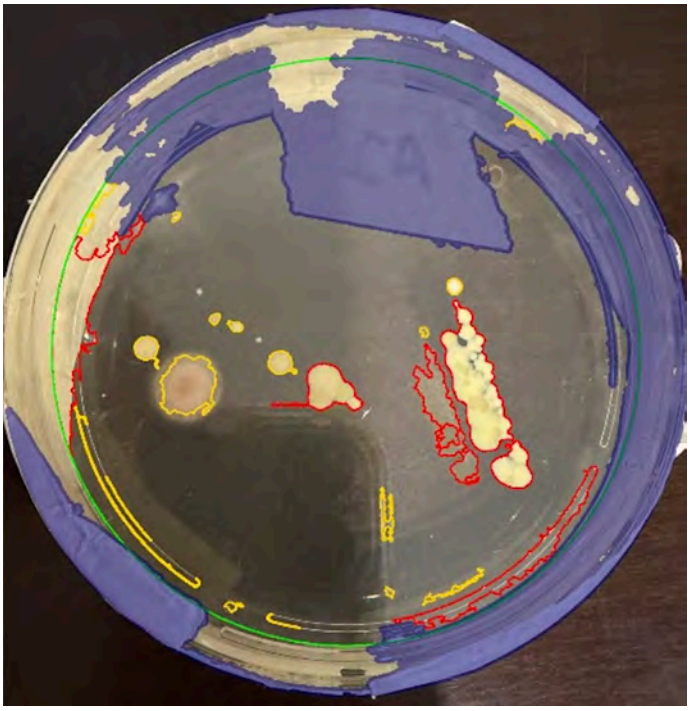
Mobile phone samples (After UV disinfection)				
C1: Phone 1 (post-cleaning with UV)	2.1%	Very Low	Very few small, round white dots around edges	Bacteria (but not much)
C2: Phone 2 (post-cleaning with UV)	4.9%	Very Low	A few white dots and two larger white, fuzzy circles	Mixed-bacteria and mold (but not much of either)
Mobile phone samples (After antibacterial wipe disinfection)				
D1: Phone 3 (post-cleaning with wipe)	0%	None	Almost clear agar, maybe one small, round cream speck	Bacteria (essentially none)
D2: Phone 4 (post-cleaning with wipe)	2.4%	Very Low	Scattered small yellow specks	Bacteria

Then I analysed photos of the plates using an automated image-analysis script.The script detected the circular agar surface (green) and excluded the rim. The script automatically masked out the tape and pen labels (blue) from growth area and total area. Bright, regularly shaped colonies or dots (bacteria; red) and irregularly-shaped, vivdly coloured shapes (mold; yellow) were detected. The program automatically calculated the % of the agar surface covered with growth relative to total area of the plate using this formula:

$$\% \text{ area covered} = [\text{Area of red and yellow labels/Total area}] * 100$$

The empty plate was treated as the control or 0% value and all other plates were reported as the % above the value of the empty plate.

This is an example of how the program processed each plate (from plate A2):

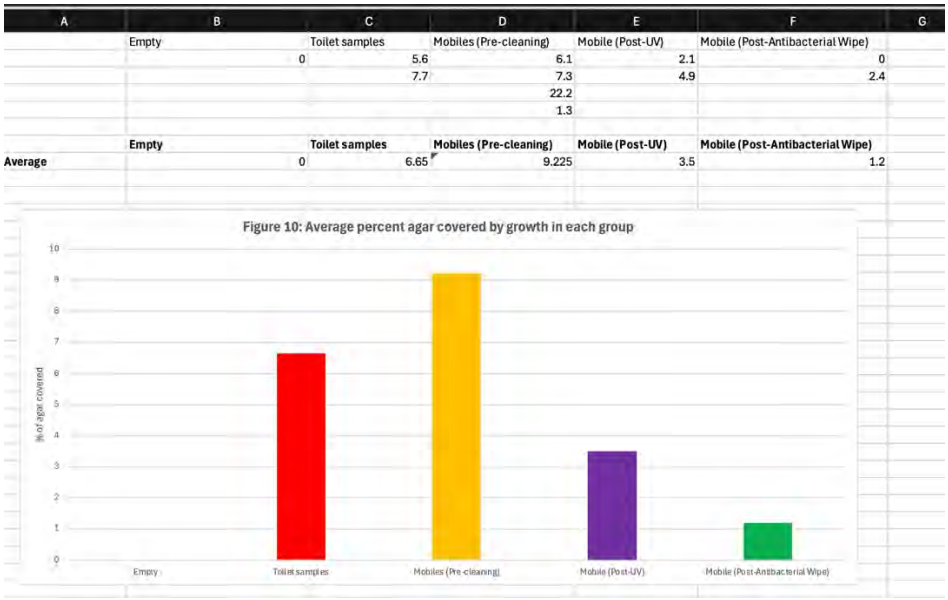


I then calculated the average percent area covered in each group using this formula:

Average % area covered = [Sum of % agar covered in all plates in group/ # of plates in group] *100

Group	**Average % agar covered**
Empty	**0%** (control)
Toilet Samples	(5.6%+7.7%)/2 *100 = **6.65%**
Mobile Phone Samples (Pre-Disinfecting)	(6.1%+7.3%+22.2%+1.3%)/4 *100 = **9.23%**
Mobile Phone Samples (Post-UV Disinfecting)	(2.1%+4.9%)/2 *100 = **3.5%**
Mobile Phone Samples (Post-Antibacterial Wipe Disinfecting)	(0%+ 2.4%)/2 *100 = **1.2%**

Finally, I used Microsoft Excel to graph the average percent area covered per group. A screenshot of the Excel data file used for graphing (with the final graph) is below.



	A	B	C	D	E	F	G
		Empty	Toilet samples	Mobiles (Pre-cleaning)	Mobile (Post-UV)	Mobile (Post-Antibacterial Wipe)	
		0	5.6	6.1	2.1	0	
			7.7	7.3	4.9	2.4	
				22.2			
				1.3			
		Empty	Toilet samples	Mobiles (Pre-cleaning)	Mobile (Post-UV)	Mobile (Post-Antibacterial Wipe)	
1	Average	0	6.65	9.225	3.5	1.2	

OSA RISK ASSESSMENT FORM

for all entries in (✓) ☐ Models & Inventions and ☑ Scientific Inquiry

This must be included with your report, logbook or entry. One form per entry.

STUDENT(S) NAME: Alexander Praino ID: 0486-017

SCHOOL: Pembroke School

Activity: Give a brief outline of what you are planning to do.

I will collect samples from mobile phones (both at baseline and after sanitising using either a UV steriliser or antibacterial wipe) and public toilets. I will culture these on agar plates for 7 days to see what bacteria grow, then observe the characteristics of the colonies. I am interested in whether sanitising the phone really stops bacteria from growing.

Are there possible risks? Consider the following:

- Chemical risks: Are you using chemicals? If so, check with your teacher that any chemicals to be used are on the approved list for schools. Check the safety requirements for their use, such as eye protection and eyewash facilities, availability of running water, use of gloves, a well-ventilated area or fume cupboard.
- Thermal risks: Are you heating things? Could you be burnt?
- Biological risks: Are you working with micro-organisms such as mould and bacteria?
- Sharps risks: Are you cutting things, and is there a risk of injury from sharp objects?
- Electrical risks: Are you using mains (240 volt) electricity? How will you make sure that this is safe? Could you use a battery instead? *Only batteries can be used for Models & Inventions entries
- Radiation risks: Does your entry use potentially harmful radiation such as UV or lasers?
- Other hazards.

Also, if you are using other people as subjects in an investigation you must get them to sign a note consenting to be part of your experiment.

Risks	How I will control / manage the risk
Please see attached for risk assessment.	Please see attached for risk assessment.

(Attach another sheet if needed.)

Risk Assessment indicates that this activity can be safely carried out

RISK ASSESSMENT COMPLETED BY (student name(s)): Alexander Praino

SIGNATURE(S): _____

☑ By ticking this box, I/we state that my/our project adheres to the listed criteria for this Category.

TEACHER'S NAME: Katja Bier

SIGNATURE: _____ DATE: 22/06/2026

Risks	**How I will control / manage the risk**
1. Handling the agar powder.	1. I will wear gloves and goggles when weighing out the agar powder. I will weigh it out in an open area with lots of ventilation. I will wash my hands before and after.
2. Preparing the agar medium.	2. This step involves mixing the agar powder with hot water to dissolve it, then boiling it in the microwave. To manage the risk, I will heat the liquid in a glass container that is at least double the volume of the media liquid so that it has space to boil. I will also wear gloves throughout and use potholders when handling the glass container following the boiling step.
3. Preparing the Petri dishes.	3. I will wear gloves and goggles when preparing the Petri dishes by pouring in the agar medium. I will also cover the Petri dishes once prepared to stop them from getting contaminated by bacteria in the air. I will wash my hands before and after.
4. Collection of samples.	4. When collecting the samples from the toilets and mobile phones, I will wear gloves to prevent bacteria from getting transferred to my hands. I will wash my hands before and after.
5. Culturing and examining the bacterial colonies.	5. When transferring each sample from the swab to its Petri dish, I will wear gloves and a mask to prevent the bacteria from getting transferred to my hands or breathing them in. I will be careful not to put my gloved hands near my face or mouth. As soon as the transfer is finished, I will cover the Petri dish with its plastic cover and tape around the dish to prevent any transfer of bacteria to nearby surfaces or the air. I will wash my hands before and after. To prevent any exposure to the bacteria colonies, I will leave the Petri dishes taped shut throughout the study. I will do all of my observation of the Petri dishes through the plastic cover, either from the

	top or the bottom. I will take all photos through the lid/bottom of the Petri dish. When handling the taped Petri dishes, I will wear gloves. I will wash my hands before and after handling the Petri dishes.
6. UV sterilisation	6. To do the UV sterilisation, I will use a PhoneSoap or HomeSoap steriliser. The UV-C lights on this switch off as soon as the door as opened, helping to reduce risk. This is chemical free and does not use heat.
7. Antibacterial wipes	7. For the antibacterial wipe, I will use Dettol antibacterial hand and surface wipes. These have been tested as being safe for use on skin.
8. Disposing of the Petri dishes.	8. When disposing of the Petri dishes, I will ask an adult to add a small amount of bleach or 70% isopropyl alcohol to each Petri dish, while wearing gloves and goggles to prevent any splashing or contamination. After 10 minutes, the adult will put the Petri dishes into a sealed plastic bag and dispose of the bag in the rubbish.
9. Dealing with an unexpected leak or spill from a Petri dish.	9. If there is an unexpected leak or spill from a Petri dish, I will alert an adult and ask them to cover the spill with a small amount of bleach or 70% isopropyl alcohol for 10 minutes before sweeping it up, sealing it in a plastic bag and placing it in the rubbish.

Note 1: I will also use good science lab techniques throughout this experiment, such as not eating and drinking when handling the Petri dishes, always wearing personal protective equipment (like gloves and goggles) and making sure there is an adult present to supervise.

Note 2: In preparing this risk assessment, I got safety tips from the following reference:

"*How to Grow Bacteria and More,"* Home Science Tool Resource Centre: https://learning-center.homesciencetools.com/article/bacteria-experiment-guide/. Accessed 1 June 2026.

Consent Form

Project Title: Would you put your face on a toilet?

Person conducting project: Alexander Praino (Pembroke School, Year 3)

Purpose of project: This project is trying to find out which has more bacteria- a cell phone or a toilet- and whether UV radiation or antibacterial wipes can actually remove bacteria from mobile phones.

What do I have to do?: If you agree to participate, you will need to give consent for your mobile phone to be swabbed with a sterile cotton swab. Your phone will be swabbed twice. Once before cleaning and once after cleaning with either UV radiation (through a PhoneSoap device) or an antibacterial wipe.

What will happen to my data?: The swab will be rubbed on an agar plate and I will watch what bacterial colonies grow. No one will be able to identify which plate belongs to which person's phone since I am not collecting your personal information with the swab. The swab will be anonymous.

Why am I doing this experiment?: This project is part of my Oliphant Science Awards Scientific Inquiry project.

What are the benefits?: I am hoping to find out if there are benefits to regular cleaning of your phone and what method might be best. The results of this experiment might help encourage people to clean their phones regularly to decrease their chances of getting sick from bacteria on their phone.

Are there any risks?: The antibacterial wipes and UV radiation are both expected to be safe for your phone. However, there is a small risk that the phone gets damaged unintentionally when collecting the swab. To minimise this risk, I will hold the phone carefully when collecting the swab.

If you would like to participate in this project, please print and sign your name in the table below.

Print Name	Signature
Lyndsey Collins-Praino	L C - P
SHANNON STUCKEY	
Dalija Kumaratilake	D. S. Kumaratilake
Amir Ghaly	