

INVESTIGATING POTENTIAL RESERVOIRS OF ANTIBIOTIC-RESISTANT PATHOGENS IN HOSPITAL ENVIRONMENTS

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Background

Hospital environments, known for high patient density and extensive antibiotic usage, have become hotspots for the proliferation of resistant microorganisms. Some emerging pathogens of concern can survive for extended periods on surfaces, especially in a healthcare setting with temperature and humidity conditions that support their viability.

Both nurses' call phones and bedside rails are important fomites that can act as reservoirs for antibiotic-resistant pathogens. These surfaces are used frequently and handled by multiple individuals throughout the day. The more a surface is touched, the greater the chance of pathogens being deposited and surviving on the surface. In busy healthcare environments, these surfaces may not receive regular and thorough cleaning. Cleaning protocols can vary, and some surfaces may contain areas that are difficult to disinfect.

Objectives

- Sampling of potential reservoirs of bacteria in hospital environments.
- Investigate the presence and abundance of select bacteria of concern present on these frequently touched surfaces and highlight their significance in infection control measures and the rise of antibiotic resistance.**
- Investigate the efficiency of cleaning regimens as well as survey the hospital environment for the occurrence of pathogens of concern.

Selective Media

The organisms being evaluated are:

- Vancomycin Resistant Enterococcus (VRE)
- Methicillin Resistant *Staphylococcus aureus* (MRSA)
- Acinetobacter baumannii*
- Carbapenem resistant enterobacteriaceae (CRE)
- Clostridium difficile* The lab is also quantifying indicators for contamination being:
- Heterotrophic plate count bacteria (HPC)
- Total Coliform

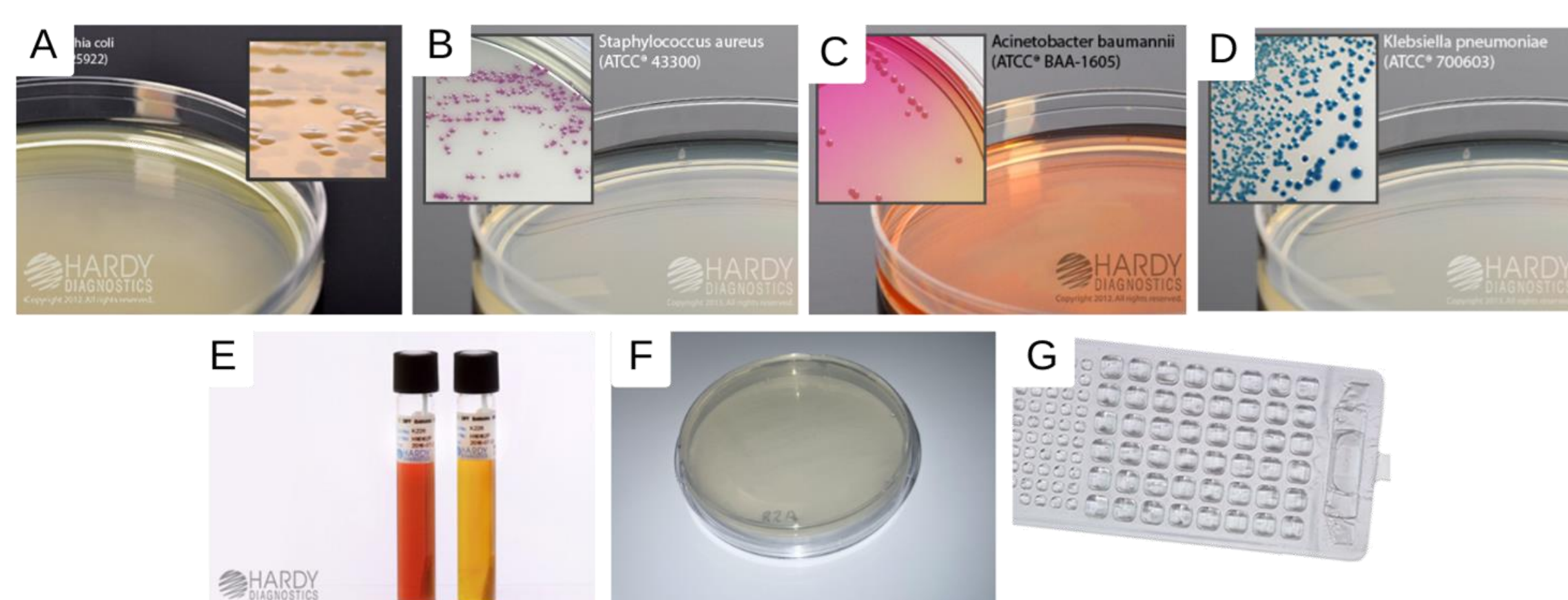


Figure 1: Selective media used for each assay. A. BHI with Vancomycin from Hardy Diagnostics, BHI with vancomycin made in lab. B. BPW Hardy CHROM from Hardy Diagnostics. C. Leeds Acinetobacter Medium from Hardy Diagnostics. D. CRE Chromogenic Medium from Hardy diagnostics. E. Banana broth from Hardy Diagnostics. F. R2A made in lab. G. Quanti-Tray/2000 from Weber Scientific.

Methods

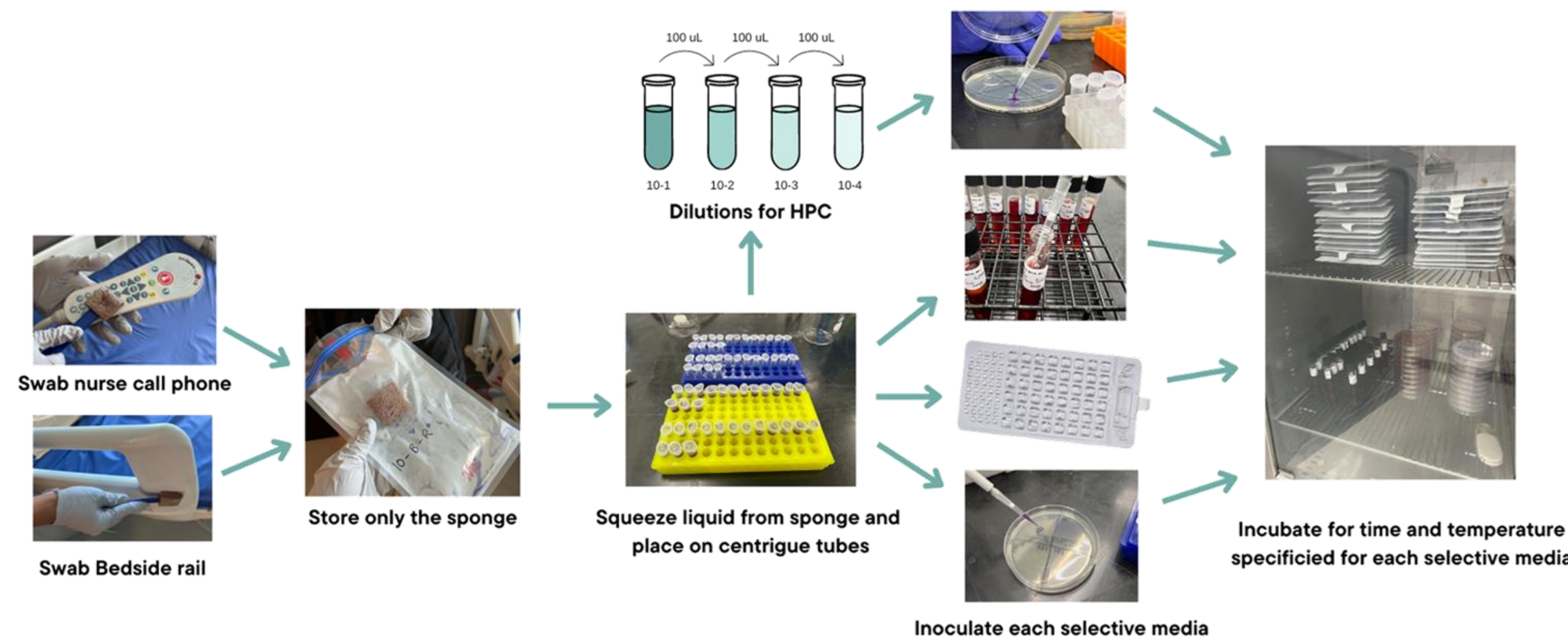


Figure 2: Sampling method and culture and testing of bacteria in samples taken from nurses' call phones and bedside rails from rooms from the LLU hospital using a 3M sponge stick with DE neutralizer before and after cleaning.

Results

Table 1: Percent positive presence of organism summary. Indicates the percent positive total, before cleaning, and after cleaning for each assay performed for target organisms, total Coliform, and HPC.

Percent positive	carbapenem resistant enterobacteriaceae (CRE)	vancomycin resistant enterococcus (VRE)	<i>Acinetobacter baumannii</i>	methicillin resistant <i>Staphylococcus aureus</i> (MRSA)	<i>Clostridium difficile</i>	Total Coliform	HPC
TOTAL	0.00%	4.84%	0%	5.00%	5.00%	-	83.87%
BEFORE	0.00%	9.38%	0.00%	6.25%	0.00%	3.13%	96.88%
AFTER	0.00%	0.00%	0.00%	0.00%	6.67%	-	68.97%

Percent reduction: 27.91%

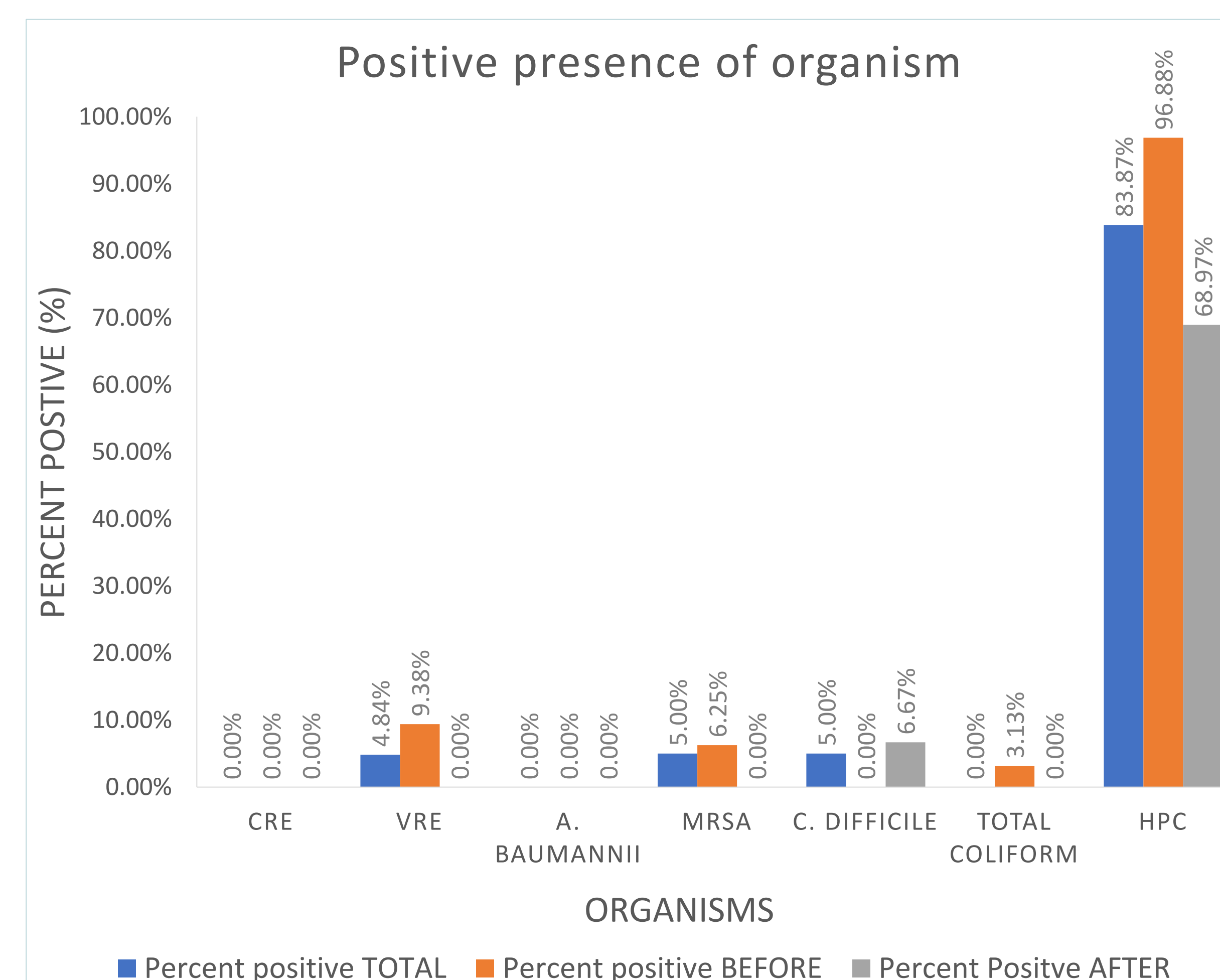


Figure 3: Bar chart for percent positive presence of organisms. Data taken from Table 1.

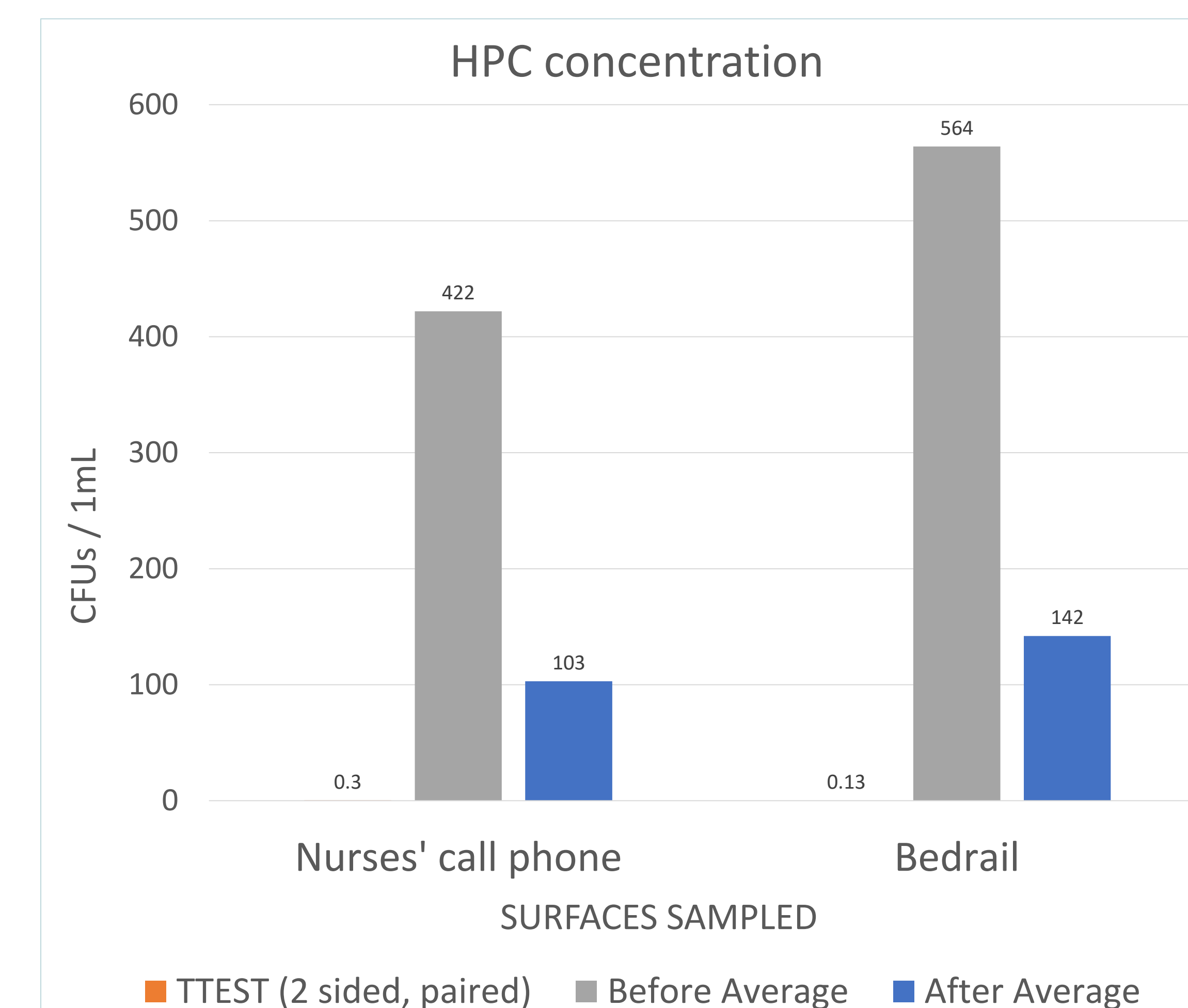


Figure 4: Bar chart for HPC concentration (CFUs / 1mL) comparison between nurses' call phones and bedrails.

Conclusions

- There was a total of 17 nurses' call phones and 17 bedrails sampled from different rooms at the LLU hospital.
- CRE and *Acinetobacter baumannii* were zero detection.
- Total coliform was very low with only 1 colony out of all 62 Quanti-trays.
- Only one *Clostridium difficile* was found to be positive on a bed rail after cleaning. (**Figure 6**)
- The assay for VRE resulted in 10% contamination before cleaning and 0% after cleaning.
- HPCs were higher concentration and higher percent positives before cleaning.
- HPCs were not significantly different with a paired t-test, but the average concentration was much lower from before to after cleaning.
- Cleaning produced a 27.91% reduction in HPC concentration. (**Table 1**)

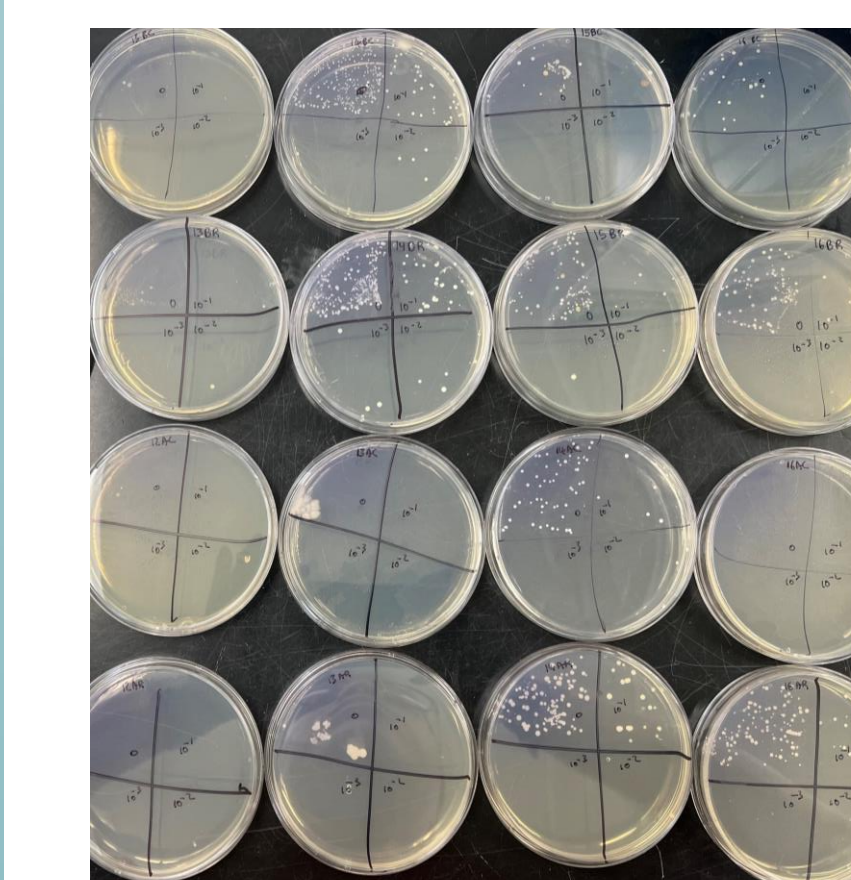


Figure 5: Some of the HPC plates after 72 hrs. being analyzed.

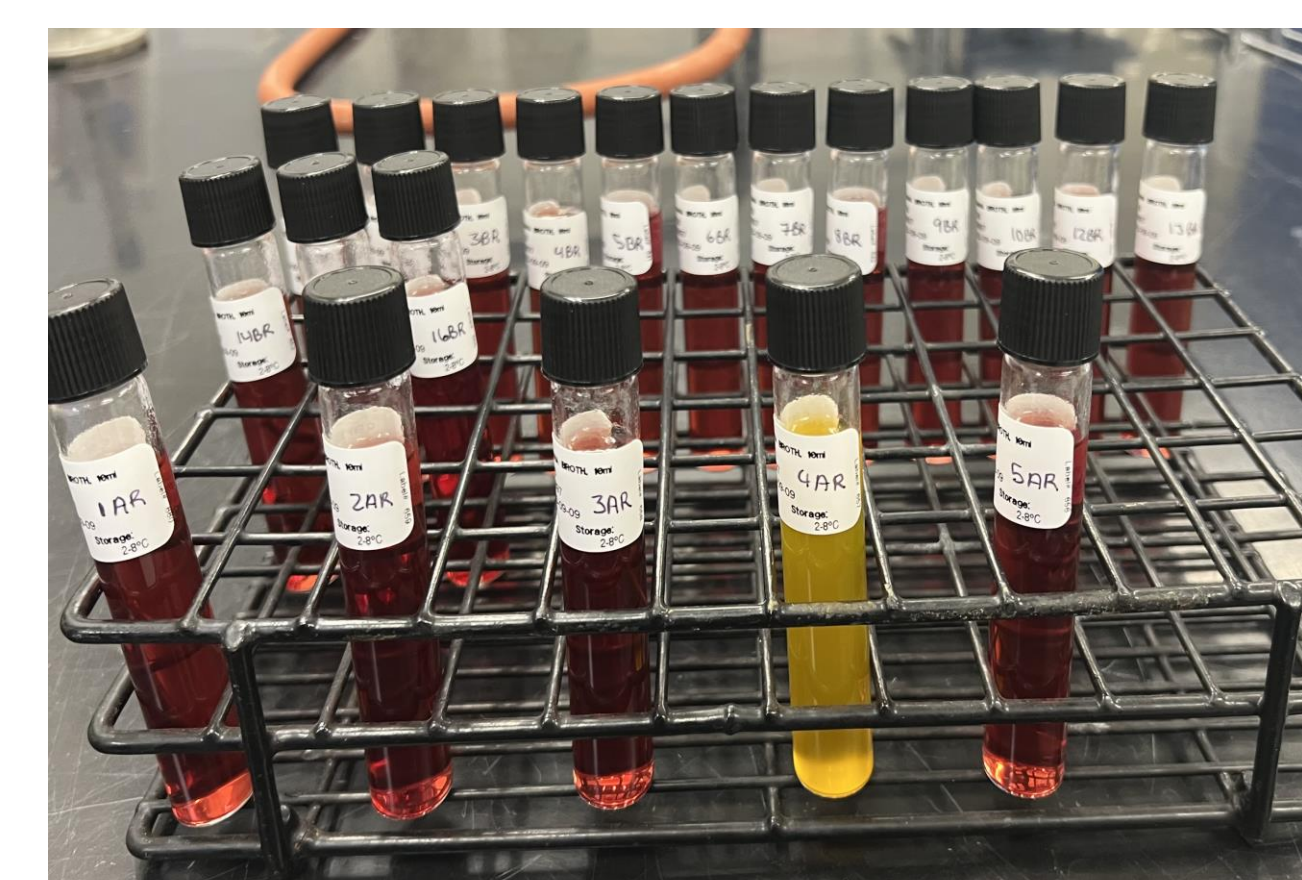


Figure 6: Banana broth after 72 hrs. Only one turned yellow indicating positive result.

References

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