

The Effect of Natural Antimicrobial Oils on *Staphylococcus aureus* in Comparison to Antibiotic Vancomycin



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Introduction

- *Staphylococcus aureus* is a Gram-positive bacteria that can cause harmful infections if not treated properly (Foster 2009)
- Treatment is typically through antibiotics, such as vancomycin (Foster 2009)
- Essential oils have been known to have antibacterial effects, with extensive research done on *E.coli* (Ramsey et al. 2020)
- This research was done to see if certain essential oils, clove, lavender, lemon, and cinnamon, would inhibit the growth of *S. aureus* as well as vancomycin does by examining inhibitory zones of the discs on a lawn of *S. aureus*



Methods

- The Kirby Bauer method from the American Society of Microbiology was used
- 15 nutrient agar plates were made for the *S. aureus* bacteria to grow on
- A broth of *S. aureus* was spread on each plate and 5 discs were placed on each and allowed to incubate for 15 minutes at 121°C
 - Vancomycin in the middle surrounded by 4 oil-soaked discs of lemon, lavender, clove, and cinnamon (Figure 2)
- The zones of clearing (inhibition) for each disc were measured and put into a statistical ANOVA test to compare them to the positive control vancomycin

Results

- Based on the measurements for the zones of inhibition, Cinnamon was by far the best out of all the oils with a mean of 30.14 mm and a standard deviation (SD) of ± 2.77 mm.
- Clove was next, with a mean of 14.54 mm (SD= ± 1.33), then Lavender with 9.067 mm (SD= ± 4.01), then lemon with no clearance at all (SD= ± 0.00 mm)
- The statistical test revealed that cinnamon works better than vancomycin, clove works the same as vancomycin, and both lavender and lemon do not work as well as vancomycin at inhibiting the growth of *S. aureus*

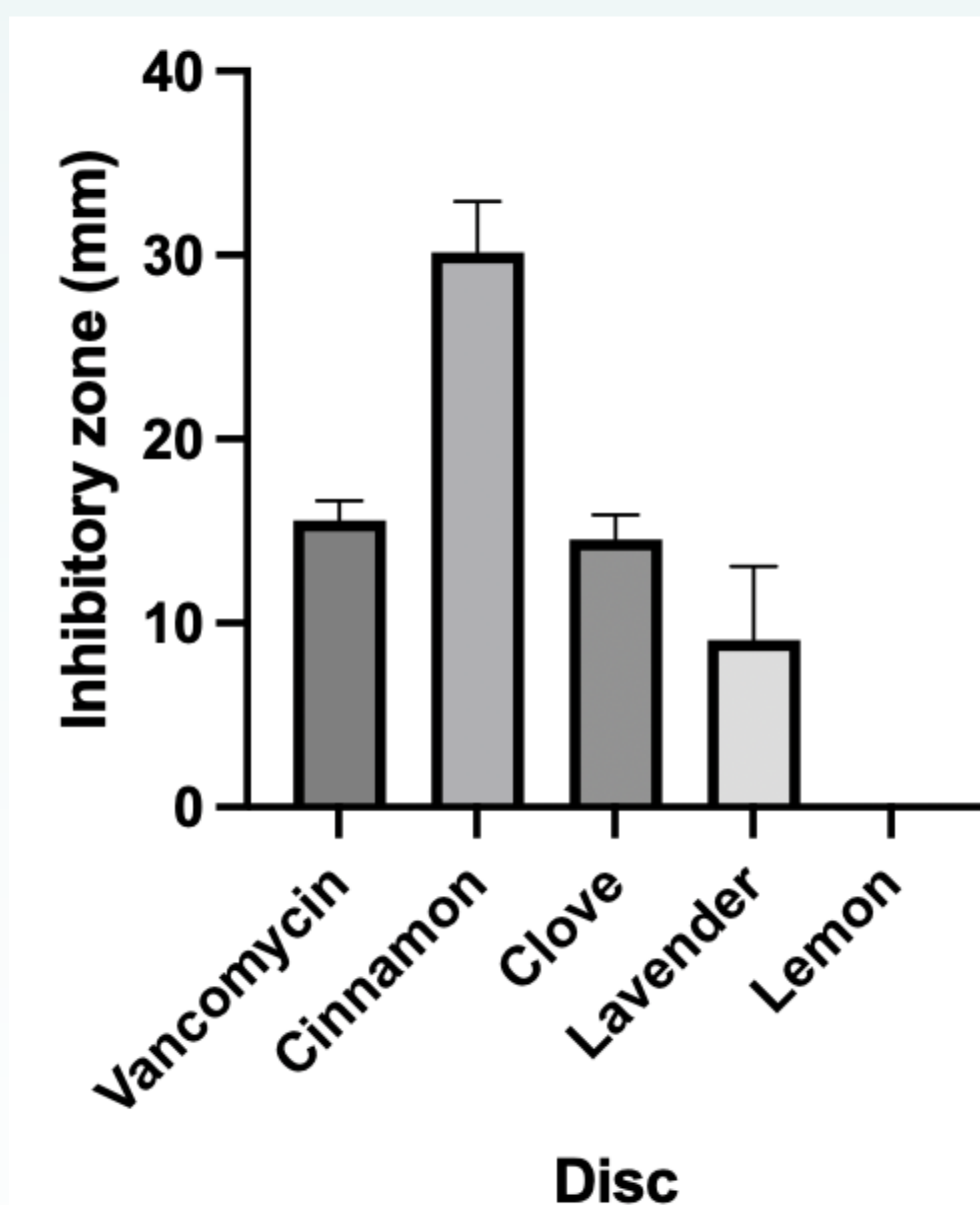


Figure 1. Histogram of average inhibitory zones and standard deviations for each of the discs. Cinnamon works significantly better than vancomycin, clove works statistically the same, and lavender and lemon work statistically less than vancomycin

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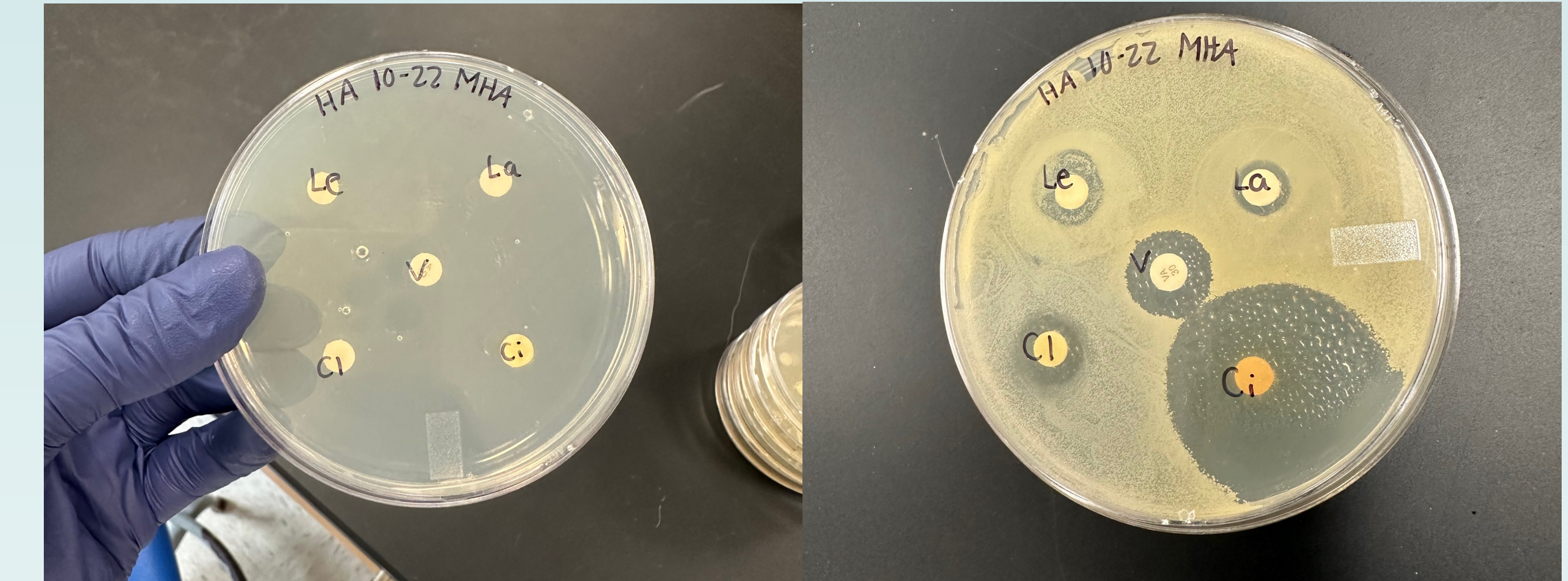


Figure 2. Before and After Incubation

The left image pictures the discs placed on the agar with recently spread *S. aureus*. The right image pictures a lawn of *S. aureus* with the inhibitory zones for each disc

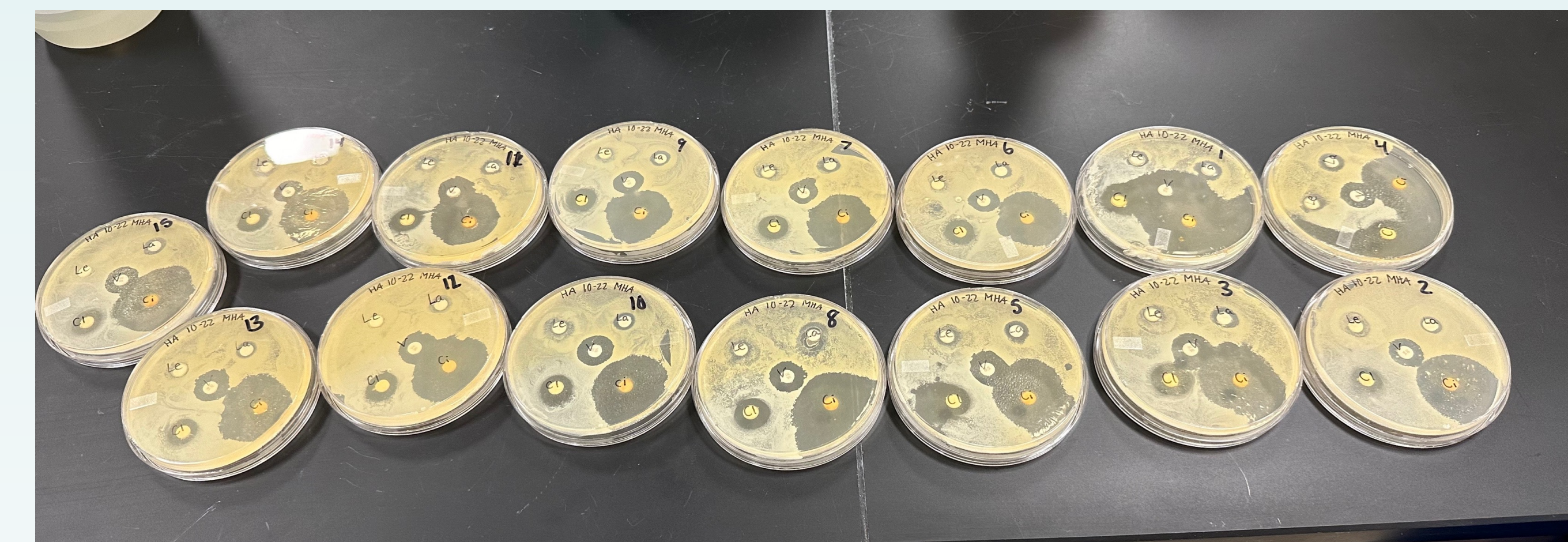


Figure 3. All 15 plates after incubation

After the plates were incubated, the growth clearances were clear and able to be measured and analyzed

Conclusions

- Cinnamon oil works better than Vancomycin at controlling the growth of *S. aureus*
- Clove oil works just as well as Vancomycin at controlling the growth of *S. aureus*.
- Lavender and Lemon oils do not work as well as vancomycin at controlling the growth of *S. aureus*.

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