

Introduction

- The main question that sparked this experiment was, why is kombucha harmful to drink if stored improperly?
- This question came about after learning that the researchers that wrote the paper "Health, wellness, and safety aspects of the consumption of kombucha" have found that when stored incorrectly the kombucha can become toxic and carcinogenic.
- We believed this was the case because at higher temperatures the bacteria growth would skyrocket making the kombucha unsafe due to the vast amount of bacteria.
- For this reason we hypothesized, if kombucha bacteria is kept at higher temperatures then the bacteria growth will increase.

Methods

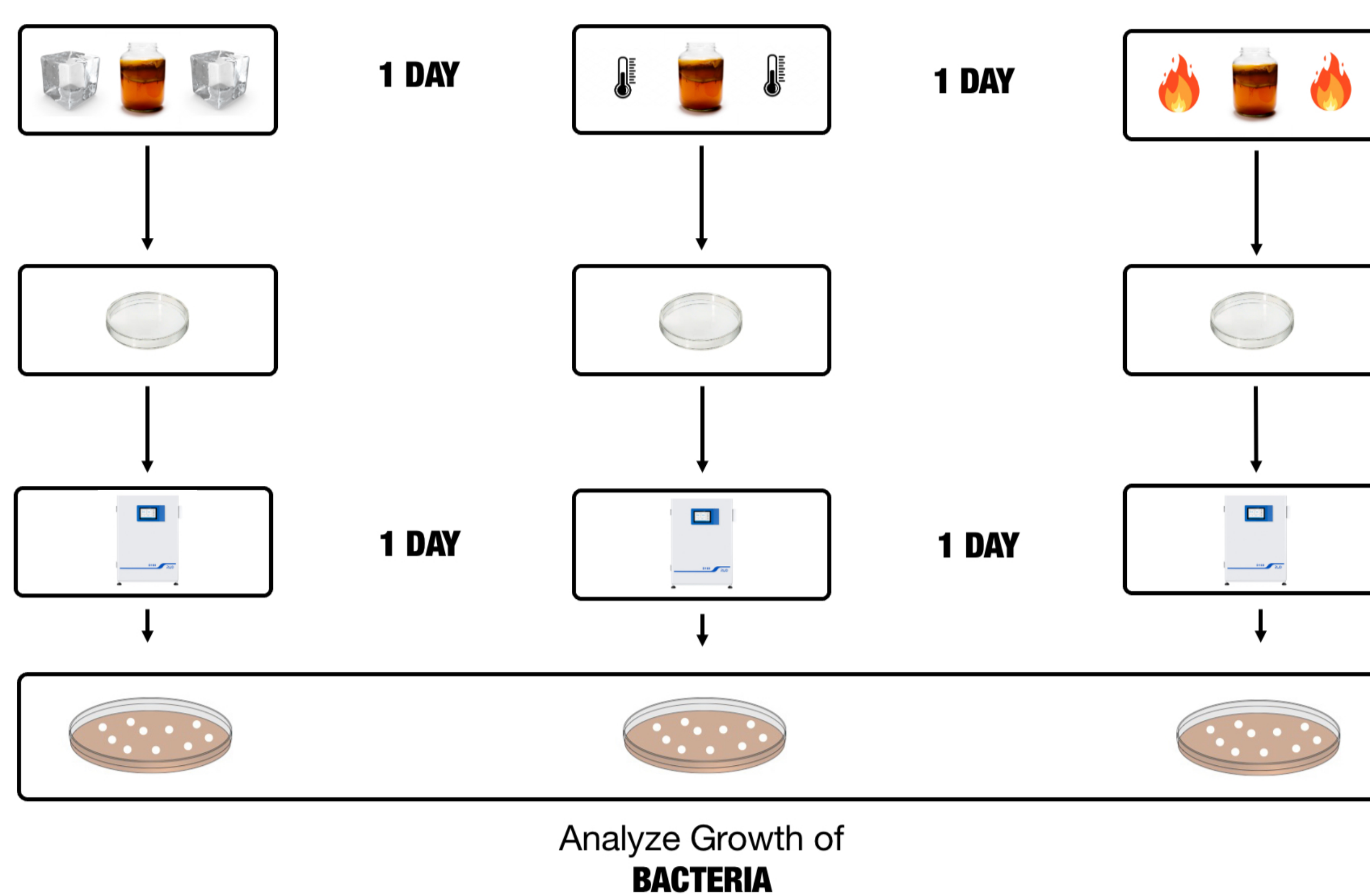


Fig 1. Kombucha Procedure. This image showcases the step by step process of how this experiment was conducted.

Methods

- 3 bottles of kombucha were stored at different temperatures. One in a refrigerator, one in a incubator and one at room temperature. They remained in these environments for 48 hours.
- After the 48 hours the kombucha bottles were taken out of their temperatures and the bottles were lightly shaken. 1mL of the cold kombucha was measured out and we began the dilution process. We started with a 1:10 dilution and went all the way to a 1:10,000,000 dilution.
- We then pipetted 100uL of the dilutions to their corresponding labeled plate. For example we pipetted 100uL of 1:100 onto the 1:100 plate.
- After each plate had 100uL of its respective dilution 4-5 glass beads was added to the plate and moved in vertical and horizontal movements to allow for the bacteria to spread. After the bacteria was spread the beads were removed from the plate.
- This process was repeated for all 7 plates for all 3 kombucha temperatures. For a total of 21 plates.
- The plates were then left in an incubator for a day and then removed. The bacteria was then counted and recorded.
- This entire process was repeated 3 times to ensure reliable results

On average refrigerated kombucha had 9,153,333 CFU/mL, room temperature had 8,273,333 CFU/mL, and incubated had 48,113,333 CFU/mL

Results

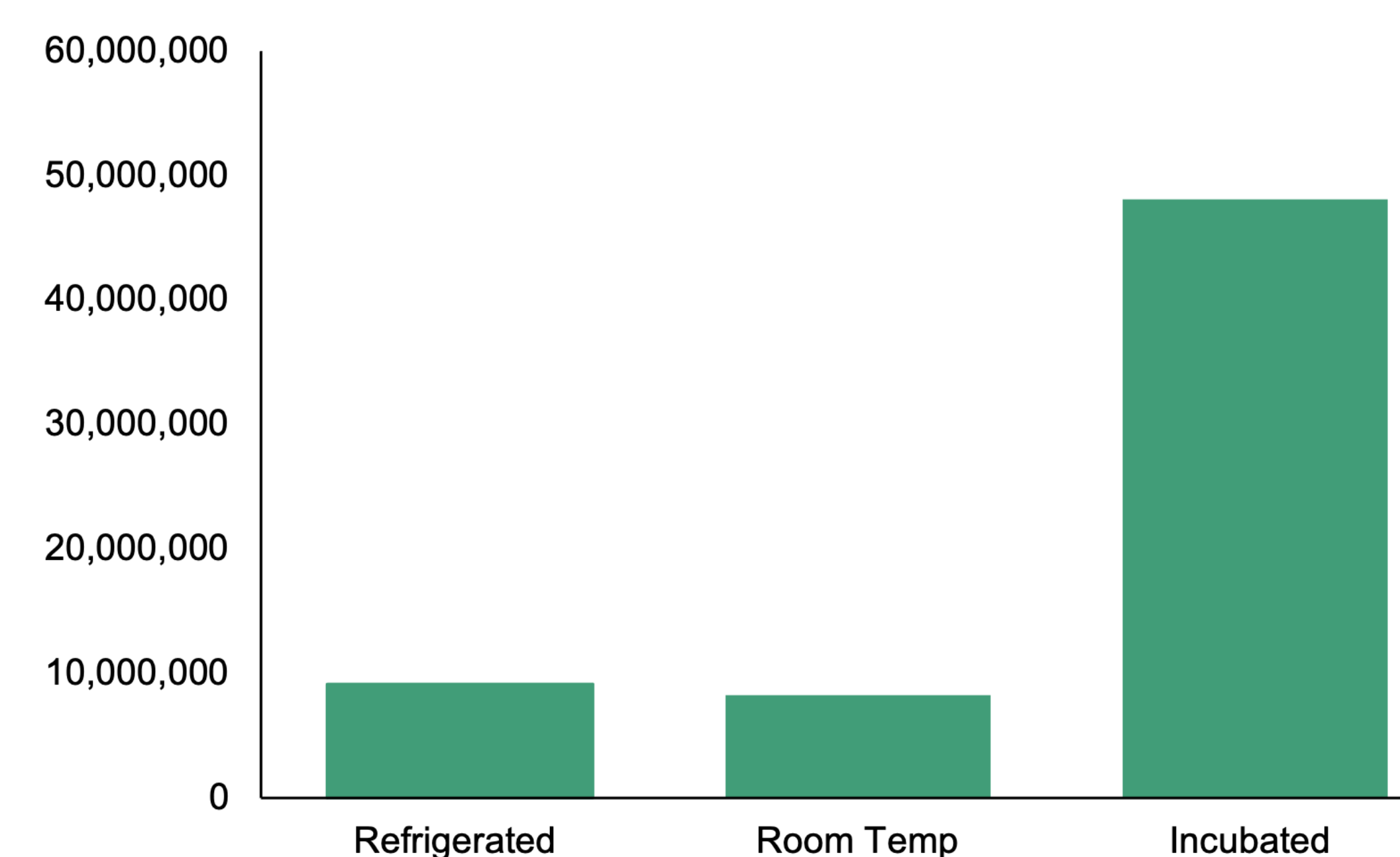


Fig 2. Average CFU/mL of kombucha bacteria stored at different temperatures after a period of 48 hours

Results

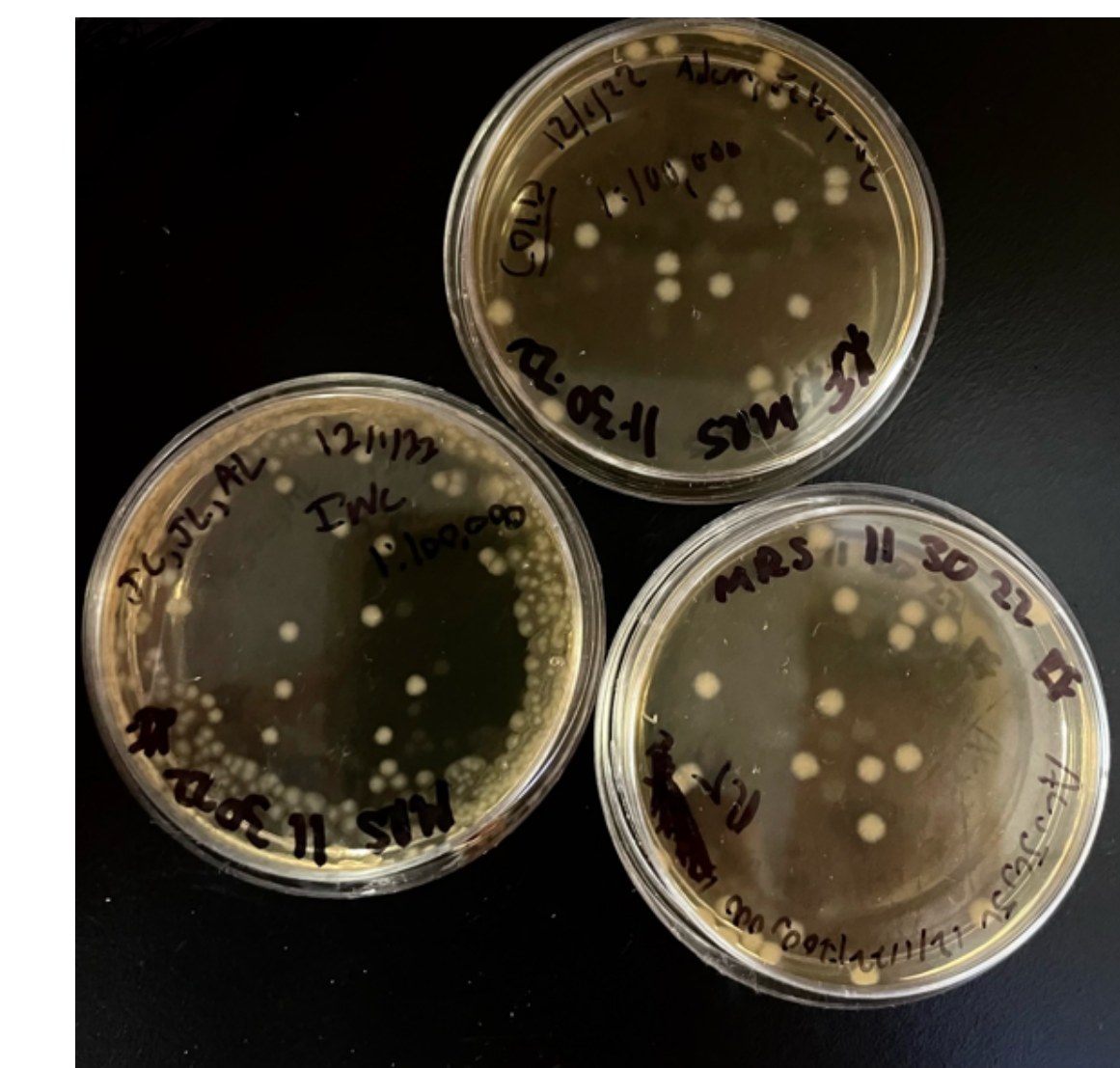


Fig 3. BACTERIA GROWTH AT 1:100,000. This image shows bacterial growth at all 3 temperatures on the 1:100:000 agar plate

- For the 1st run the cold plate had 26 colonies, the room temperature plate had 23 colonies and the incubated plate had 142 colonies. These numbers were found in the 100,000 dilution plate.
- For the 2nd run the cold plate had 68 colonies, the room temperature plate had 108 colonies and the incubated plate had 128 colonies. These numbers were found in the 1,000 dilution plate.
- For the 3rd run the cold plate had 78 colonies, the room temperature plate had 108 colonies and the incubated plate had 106 colonies. These numbers were found in the 1,000 dilution plate.

Conclusion/Future Discussion

- The results show that kombucha at very hot temperatures will have much more bacteria than at cooler temperature. These results do support our original hypothesis.
- To further test this hypothesis the experiment can be run again with more relevant day to day temperatures. Such as a hot car, non air conditioned room and other common temperatures.

References

- Watawana, M. I., Jayawardana, N., Gunawardhana, C. B., & Waisundara, V. Y. (2015). Health, wellness, and safety aspects of the consumption of Kombucha. *Journal of Chemistry*, 2015. <https://link.gale.com/apps/doc/A454429197/AONE?u=bo-ca54337&sid=bookmark-AONE&xid=6a247914>
- Davis Disan is a scientist and educator striving to share her curiosity and love of science with others. Research Associate for the STEM PUSH Network University of Pittsburgh, D. (2019, February 7). *Experiment with fermentation using Kombucha*. RockEDU. Retrieved November 29, 2022, from <https://rockedu.rockefeller.edu/component/experiment-with-fermentation-using-kombucha/>