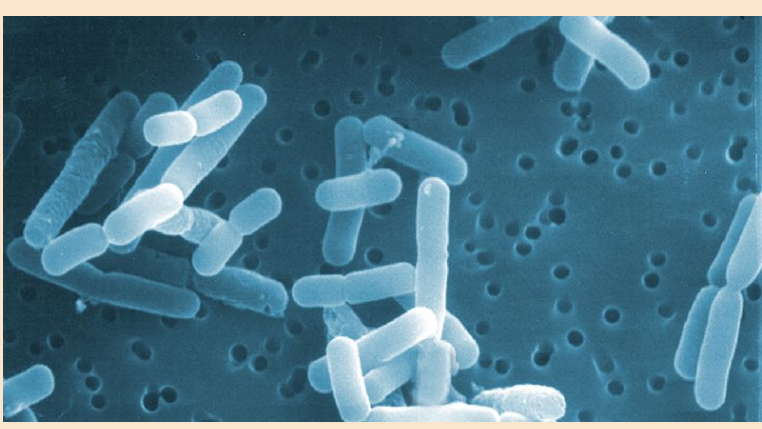




Testing for Antibiotic Resistance in Commercial and Homemade Kombucha

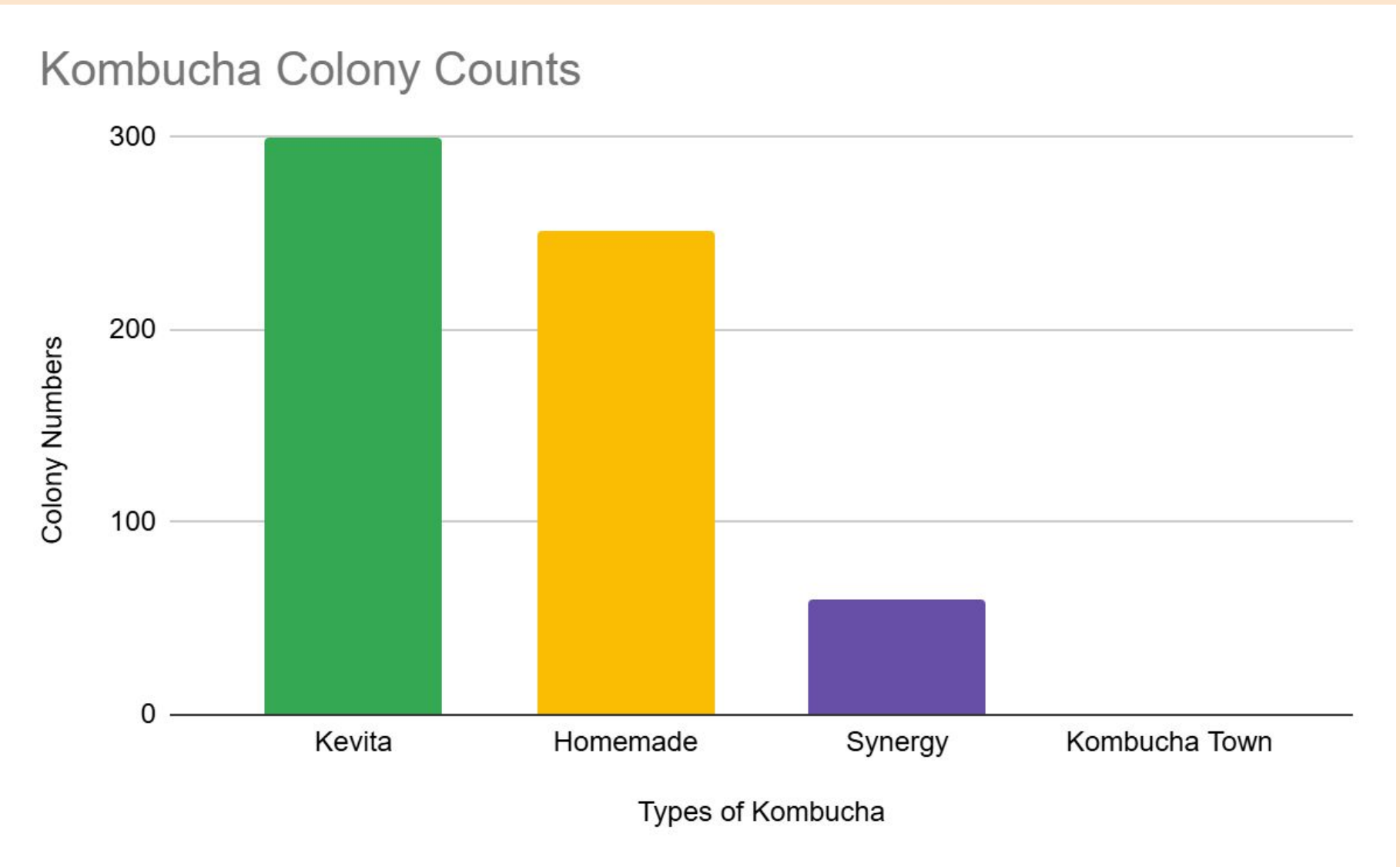
Team SCOBY: North Beckman, Wei Yeap, Kelsey Alcaraz
Biology II (222)



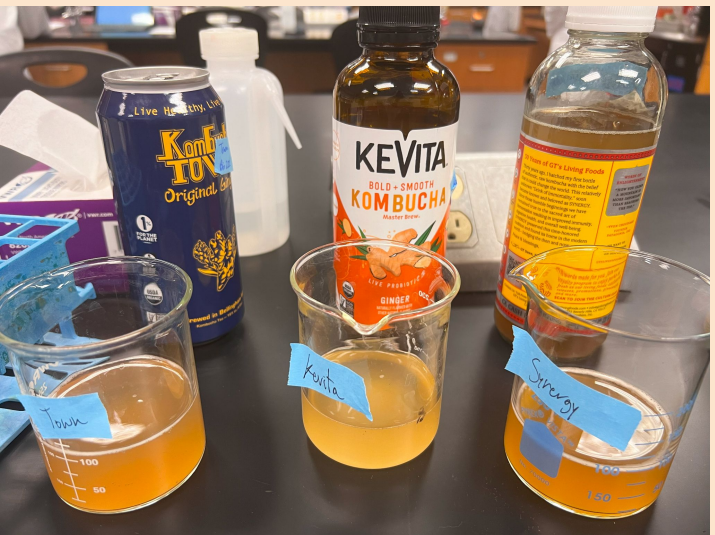
Kombucha Bacterial Species Across our Samples



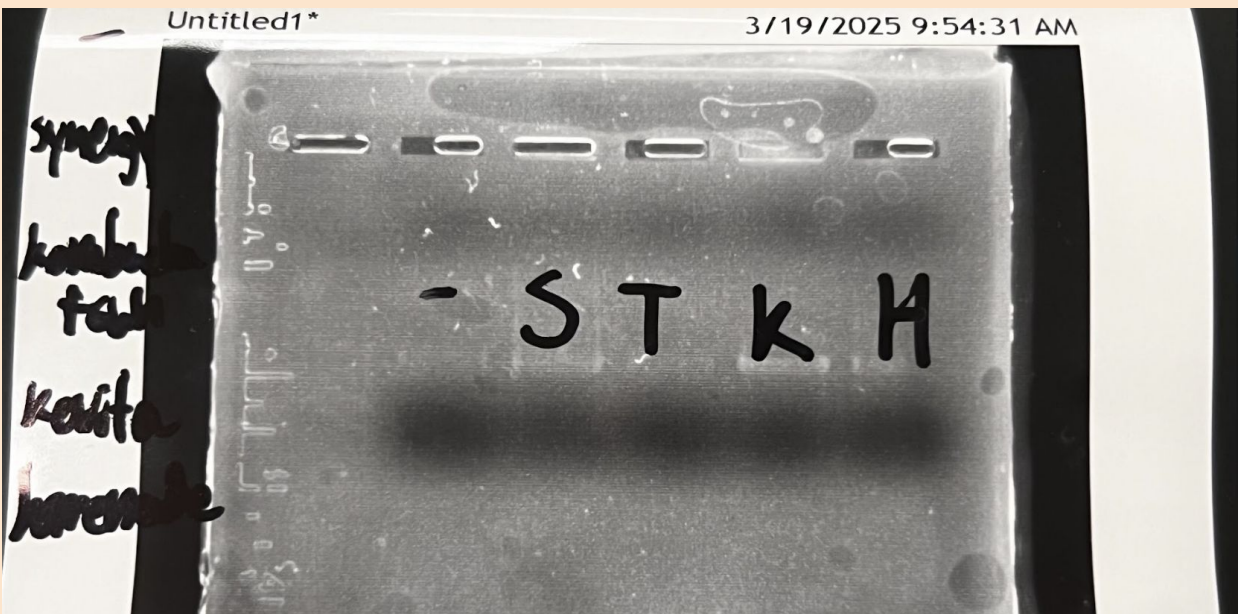
Comparisons of the probiotic species found in our samples and some information about them



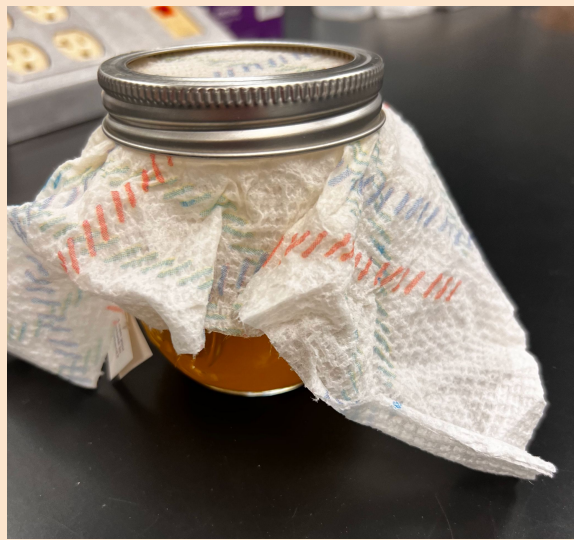
Kevita: 300+ | Homemade: 251 | Synergy: 60 | Kombucha Town: 0



Monday 3/10/2025. Plating our store-bought kombucha



Wednesday 3/19/2025. Our agarose gel print-out



Wednesday 3/12/2025. The homemade kombucha

Abstract

Kombucha, a fermented tea beverage, has gained popularity due to its potential health benefits and unique flavor. This study investigates the possibility of antibiotic resistance in 4 variations of kombucha: homeade kombucha and 3 store bought, commercial kombucha A total of 12 plates were prepared to cultivate and enumerate bacterial colonies present in each variation.

Introduction

Does kombucha, a popular drink for its live probiotic cultures, experience any antibiotic resistance? Probiotics are cultured and added to kombucha, along with yeast and sugars, to support their growth. However, since probiotics and antibiotics share environments within the gastrointestinal tract, the risk of the microbes added to kombucha and developing antibiotic resistance is a possible danger. We have seen antibiotic resistance in probiotics, but have not seen those in kombucha develop it. The purpose of this study is to see if probiotics within kombucha contain antibiotic resistance properties, and if they could possibly make the jump to the human GI tract, transferring these properties to our own natural gut biome.

Research Question: Is Kombucha a reservoir of antibiotic resistant bacteria, what is the nature of their antibiotic resistance, and could it be shared among probiotics already in the human gut?

Methods

Materials & Location

Three store bought kombucha brands will be tested: Synergy, Kevita, and Kombucha Town. One homemade kombucha will also be tested, with roughly 1 week - 2 weeks to allow for fermentation. All will be tested for antibiotic resistance in bacteria-supporting, anti-fungal treated petri dishes, featuring a control group with no exposure to antibiotics, a group of tetracycline x3, and a group of tetracycline x6. They will be spread evenly using glass beads and left for 48 hours to grow, allowing us to see if the probiotics from the kombucha grow despite the presence of the antibiotic tetracycline.

Procedure

First, we plated our kombucha types: Synergy, Kombucha Town, Kevita, and the homemade. They were left for a full week to grow since kombucha bacterial colonies typically need more time. Once they were given a week to grow, we ran gel electrophoresis to extract the DNA from the colonies, using 2 colonies per sample strip. We then did PCR (polymerase chain reaction) and finally, the agarose gel procedure. We then ran BLAST to get our species.

Discussion

Bacterial growth was found in the non-tetracycline (control) plates for Synergy, Kevita, and homemade kombucha, but not for Kombucha Town. However, no bacterial growth was observed on any of the tetracycline-treated plates, meaning that none of the bacteria in the kombucha samples were resistant to the antibiotic.

Our hypothesis that kombucha contains antibiotic-resistant bacteria was not supported. The absence of bacterial growth on tetracycline plates suggests that the kombucha samples did not contain antibiotic-resistant bacteria. This may be due to pasteurization in store-bought kombucha, which kills bacteria, or simply that these bacteria were not exposed to antibiotics in their environment and did not develop resistance.

Previous studies have found antibiotic resistance in probiotic bacteria from other fermented foods. However, kombucha may have a different mix of microbes compared to other probiotic foods. A limitation of this study is that we did not test raw, unpasteurized kombucha, which could have a wider variety of bacteria, possibly including antibiotic-resistant ones.

This study helps us understand the bacteria in kombucha and their potential role in antibiotic resistance. Our results suggest that store-bought and homemade kombucha do not contain antibiotic-resistant bacteria. However, future research should look at raw, unpasteurized kombucha to see if it contains resistant bacteria.

Acknowledgements

We would like to thank Tealia Slagle for their guidance and support throughout this research, as well as her assistance with lab procedures, PCR analysis, and data interpretation. We also appreciate the support of our institution's biology department for providing lab space and necessary materials.

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