



Antimicrobial impact of lime juice on raw shrimp

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Introduction

The main goal of this experiment was to determine how much bacteria may be consumed when eating foods such as ceviche. Many people eat these foods without considering how much bacteria may still be present, so testing this could either show that it is safer than expected or reveal potential risks. Lime juice is considered an antiseptic because it contains a high concentration of citric acid, which creates a low pH environment that can inhibit or kill some types of bacteria. This experiment was conducted to observe how effective lime juice is compared to cooking in reducing bacterial growth on shrimp

Research Question: How much does lime juice "cook" shrimp?

Hypothesis: I hypothesized that the shrimp with lime juice would be as bacteria-free as the heat-cooked shrimp.

Methods/ Materials

Shrimp preparation:

Three raw shrimp were purchased from a local supplier, along with two organic limes. Each shrimp was separated into individual containers, no shrimp were washed prior to treatment, and processed as follows:

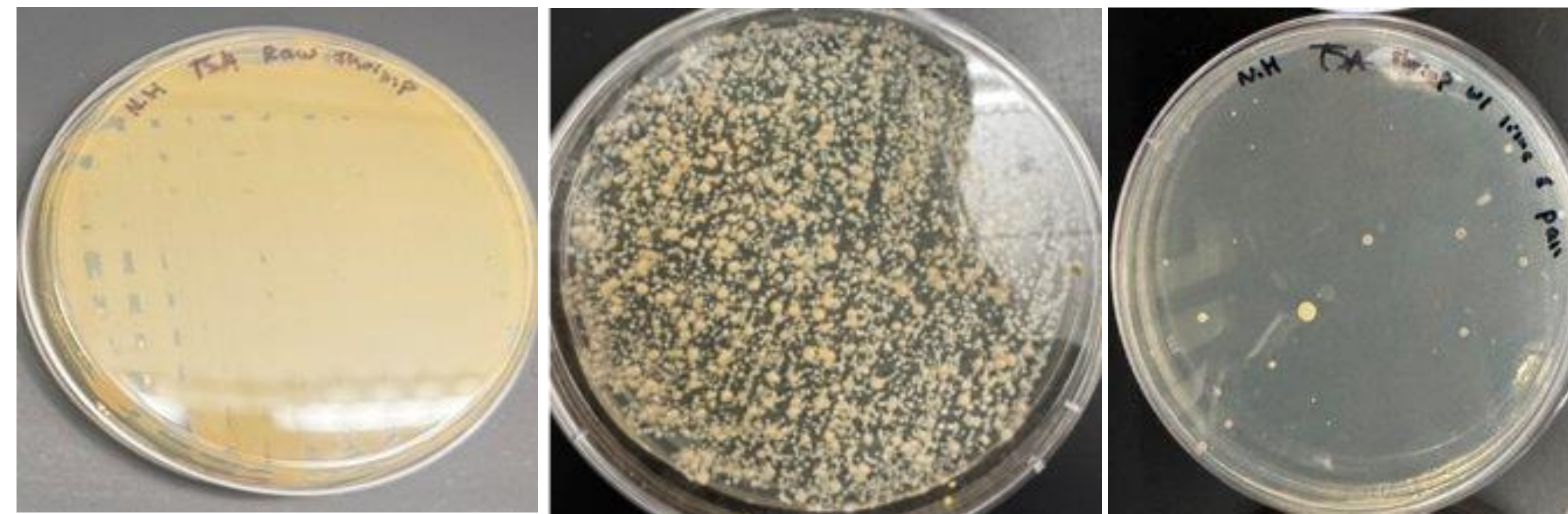
- 1) One shrimp was treated with lime juice for 15 minutes or until it turned pink, indicating it was "cooked"
- 2) One shrimp was cooked in heat for three minutes and then soaked in lime juice for 15 minutes
- 3) One shrimp was left untreated as a control

Culturing procedure:

Each shrimp was cultured identically as follows:

- 1) Sterile cotton swabs were used to take samples from the shrimp
- 2) Swab was then wiped across a TSA plate
- 3) Three samples were taken from each treatment group
- 4) Cultures were incubated 24 hours at 37deg C

Results



A

B

C

Figure 1 A-C. Representative results from the experiment. A) shows the amount of bacteria cultured from the control, raw, shrimp. The plate is completely covered with bacteria (or describe as best you can what the plate looks like - all one culture, etc.). B) These results are representative of the shrimp treated with lime juice only. There are fewer colonies on the plate indicating that the lime juice does inhibit the growth of some species of microorganisms; however, it does not inhibit all the growth, indicating that the lime juice does not "cook" the shrimp as previously indicated. C) results from the heat-treated shrimp show little to no bacterial growth

Conclusions

The results of this experiment showed that lime juice does not have a high enough concentration of citric acid to fully sterilize food or eliminate all bacteria present on shrimp. Although the shrimp appeared "cooked" after being soaked in lime juice, this change was due to protein denaturation caused by the acidic environment, which disrupts hydrogen and ionic bonds that maintain the protein structure. While the lime juice lowered the pH and created conditions that made it more difficult for bacteria to grow, it did not destroy bacteria as effectively as cooking with heat. Therefore, lime juice functions as a bacteriostatic substance, meaning it inhibits bacterial growth, rather than a bactericidal substance, which would kill the bacteria completely.

Future Directions

In future experiments, the shrimp could be soaked in lime juice for a longer period of time, such as overnight, to determine whether increased exposure time would further reduce bacterial growth compared to the 15-minute treatment used in this experiment. Additionally, a possible source of error occurred when one of the cooked shrimp samples was cut in half and only their side portion was used, which may have affected the bacterial results compared to the other samples that were tested from the outer surface. Future trials should keep sample preparation consistent across all shrimp to improve accuracy and reliability of the results.

References

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