Plasma vs. Bacteria : The Fight for Salmon Fillet

Utilizing Plasma-Activated Mist to Disinfect Salmon Tissue

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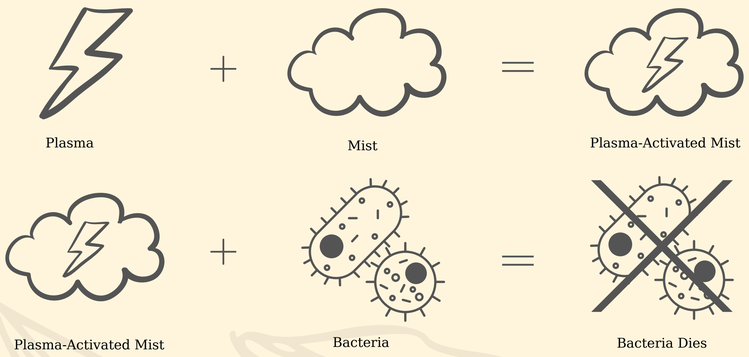
STAR SCHOLARS

DREXEL UNIVERSITY Undergraduate Research & Enrichment Programs
Pennoni Honors College

AAPlasma

Overview

Plasma is a rising technology in the field of food sanitization. The reactive species created by plasma, when mixed with a medium like mist, can be used to disrupt the cell structures of microbes, eventually inactivating them. This comes useful when treating food to not only lengthen shelf life, but also prevent foodborne illnesses.

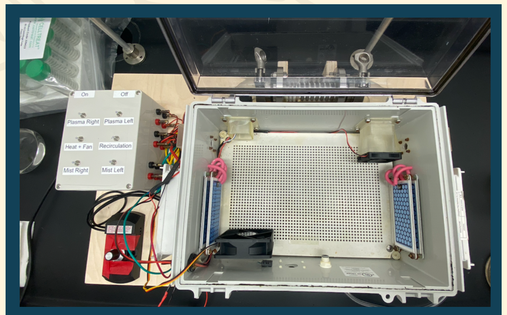


Past research has shown non-thermal plasma being tested on vegetables and fruits, displaying promising results as they reduce the bacterial presence on these specimens. However, little testing has been done on other food materials, such as meat. **The current research aimed to prove that non-thermal plasma-activated mist can reduce bacterial concentration in salmon tissue, a type of meat.**

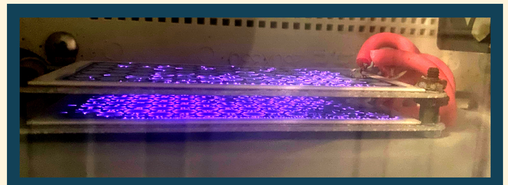
Machine Details

OxyFog, a plasma chamber from AAPlasma that consists of:

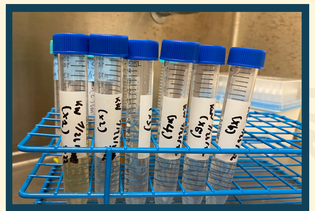
- Two Fluid Nebulizers
- Two DBD Plasma Generators
- Recirculation Fan
- Heating Coil and Fan



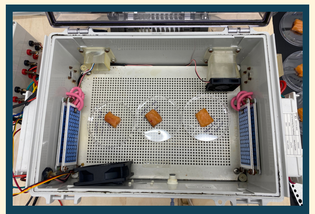
OxyFog

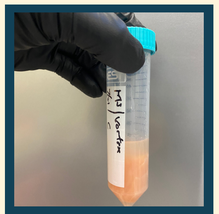

Dielectric Barrier Discharge (DPD) Plasma

Procedure

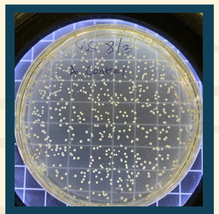

Serial Dilution

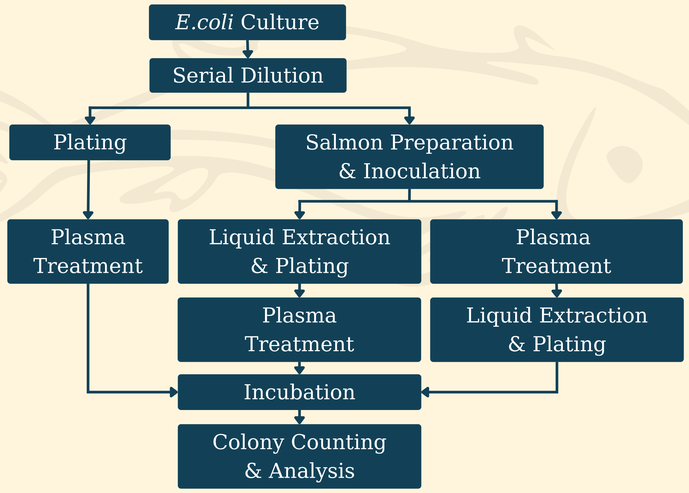

Preparation & Inoculation


Plasma Treatment


Liquid Extraction

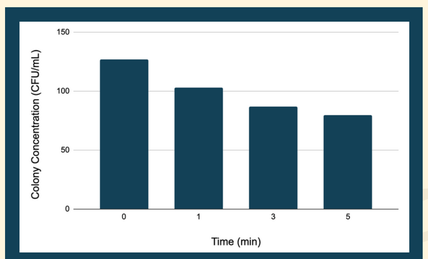

Plating


Colony Counting

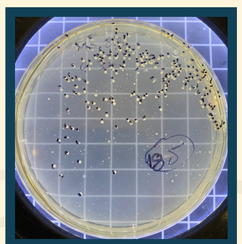


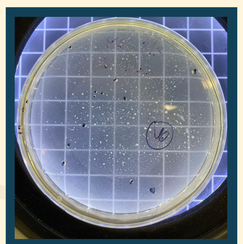
Results

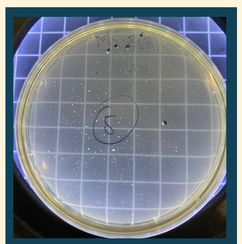
E.coli on Salmon



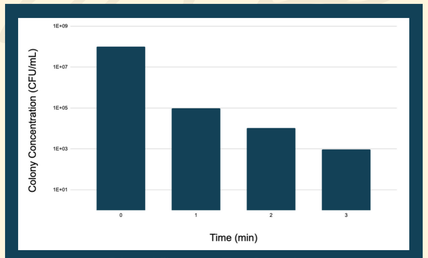
Moderate Reduction


1 Minute

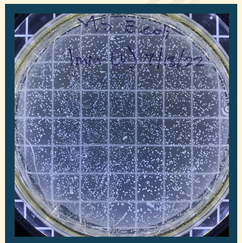

3 Minute

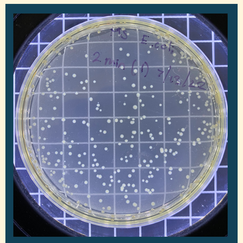

5 Minute

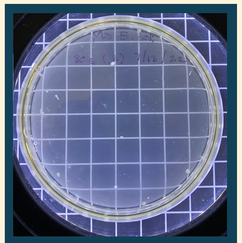
E.coli on Tryptic Soy Agar (TSA)



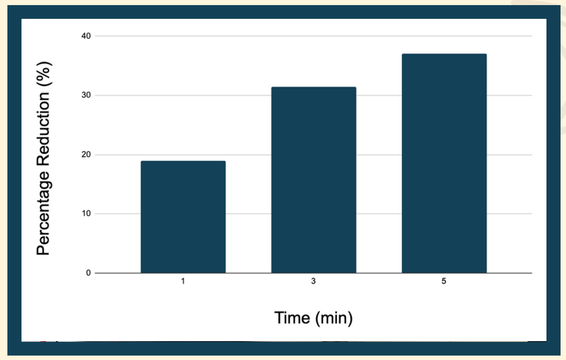
Significant Reduction


1 Minute


2 Minute


3 Minute

- Plasma-Activated Mist has the ability to inactivate *E.coli* on the surface of Salmon and on Tryptic Soy Agar
- Longer durations of plasma treatment led to a higher degree of bacterial reduction.
- For treatment on Salmon, *E.coli* concentration was reduced by 18% at 1 min, 31% at 3 min, and 37% at 5 min treatment (shown in graph below).



Conclusion

The current research has shown the potential of non-thermal plasma in *E.coli* inactivation on salmon tissue. At 1 minute of plasma treatment, the data showed that *E.coli* inoculated on salmon has been reduced by 18%, and reduced by around twice as much (37%) at 5 minutes of treatment.

Though the data from the research has shown favorable results, further research is still required to consider any of the treated samples as safe to eat. Side effects of prolonged exposure such as browning and bleaching may be areas of further study.

Especially in a growing global population, the way food is processed and managed has been more significant than ever. Plasma technology may soon become an alternative to current food preservation methods such meat curing, which involves adding potentially harmful chemicals, such as nitrates and nitrites. Lastly, it only requires air, water, and electricity.