## In vitro Analysis of Plasma Activated Water: A Step Toward Effective Plasma Medicine

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## Abstract:

The medical community has recently shown a great interest in Plasma Activated Media (PAM), due to their potential for delivering Reactive Oxygen and Nitrogen Species (RONS) on surfaces without encountering the limitations posed by direct application of cold plasma. This has opened up a vast and exciting field of research in plasma medicine [1].

In this study, we aimed to explore the effects of Plasma Activated Water (PAW) on in-vitro experiments involving bacteria and viruses. Our experiments were carried out with the utmost care and precision to ensure the validity of our results.

The results of our experiments were highly encouraging. PAW was found to significantly reduce the infectivity of viruses and inhibit their replication in infected cells, without causing any measurable harm to the cells or inducing inflammation. The treatment was also lethal to the bacterium Pseudomonas Aeruginosa, demonstrating its potential for effectively targeting and eliminating harmful microorganisms.

In order to optimize the delivery of RONS and to determine the relative concentrations of different species, we used emission UV-VIS spectra obtained from the jet of cold atmospheric plasma during water activation, and absorption spectra of the PAW, to gain a deeper understanding of the molecular species present in the solution.

The results of this study have the potential to be highly impactful, not just in the field of plasma medicine, but also in the broader field of microbiology and infectious disease research. The ability of PAW to effectively target and eliminate harmful microorganisms without causing harm to healthy cells is a major advancement in the fight against infections and disease. The optimization techniques we employed in the study could also be used in the development of new and more effective plasma-based treatments, which could have far-reaching implications for human health.

**Keywords**: Plasma Activated Media, Reactive Oxygen and Nitrogen Species, Antimicrobial effect, Plasma medicine, Cold plasma, UV-VIS spectra, Absorption spectra.



**Figure 1**: UV spectrum of air atmospheric plasma during the water activation process.

## **References:**

 Renwu Zhou et al., "Plasma-activated water: Generation, origin of reactive species and biological applications," J. Phys. D. Appl. Phys., vol. 53, no. 30, 2020.