PLASMA JETS AND MULTIJETS IN CONTACT WITH LIQUIDS IN BIOMEDICAL EXPERIMENTS: ELECTRO FLUID DYNAMIC AND REACTIVE SPECIES DISTRIBUTION

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Abstract. Plasma jets are being intensively studied for biomedicine applications but their fine control remains challenging due to the mutual interactions between plasma and target. Even considering perhaps one of the simplest scenario in a research laboratory, using a plasma jet to treat a 2D culture of cells in a plastic multi-well plate, it is not known in detail how the physical environment of the micro-well may influence the nature of the plasma jet treatment. This study aims to shed light on this topic by investigating how electro fluid dynamic (EFD) flows influence the delivery of the bioactive plasma-generated RONS when a plasma jet is used to treat a biologically-relevant liquid (i.e. PBS) in a standard tissue culture grade 24-well plate. The results show how the formation of complex EFD flows in the liquid induce a non-uniform distribution of the RONS. Shortly after the ignition of the plasma jet an initial rapid liquid stream can reach the bottom of the well, whereas a stable vortex mixing is observed few seconds later. Electric charge accumulation on the liquid surface and plasma induced gas swirling could be the causes of the liquid motions. Furthermore, the liquid depth/volume and the voltage polarity are found to be critical parameters in controlling the delivery of the RONS to the bottom of the well.

References

Mohades, S., Lietz A., Kruszelnicki, J., Kushner, M. J. : 2020, *Plasma Processes and Polymers*, **17**, 3

Stancampiano, A., Chung, T.-H., Dozias, S., Pouvesle, J.-M., Mir, L. M., Robert, E. : 2019, *IEEE Trans. Radiat. Plasma Med. Sci*., **4**, 3