Abstract Submitted
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Uniform dose atmospheric pressure microplasma exposure of individual bacterial cells[1] DAVID RUTHERFORD, CHARLES MAHONY, SARAH SPENCE, FATIMA PEREZ-MARTIN, COLIN KELSEY, NEIL HAMILTON, Ulster University, DECLAN DIVER, EUAN BENNET, HUGH POTTS, University of Glasgow, DAVIDE MARIOTTI, DAVID MCDOWELL, PAUL MAGUIRE, Ulster University — Plasma – bacteria interactions have been studied for some time with a view to using plasma exposure for wound healing, sterilization and decontamination. While high efficacy has been demonstrated, important fundamental mechanisms are not understood and may be critical for ultimate acceptance. The dose variation across the exposed population and the impact of non-lethal exposure on subsequent bacterial growth are important issues. We demonstrate that individual bacterial cells can remain viable after exposure to a uniform plasma dose. Each bacteria cell (E coli) is delivered to the atmospheric pressure plasma in an aerosolised droplet (d $\sim$ 10 micron). The estimated plasma density is 1E13 – 1E14 cm^{-3}, gas temperature <400K, and exposure times vary between 0.04 and 0.1ms [1]. Droplet evaporation in flight is $\sim$ 2 micron and plasma – cell interactions are mediated by the surrounding liquid (Ringers solution) where plasma-induced droplet surface chemistry and charging is known to occur. We report the cell viability and recovery dynamics of individual exposed cells as well as impact on DNA and membrane components with reference to measured plasma parameters.

[1] P. Maguire et al: Appl. Phys. Lett. 106 (2015) 224101

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