Helium atmospheric pressure plasma jet aiding chemotherapy for the treatment of breast cancer

C Anastassiou[1], C.Lazarou[1,2], C. T. Mihai[3], D. Ciubotaru[4], I. Mihaila[5], I. Topala[4], and G E Georghiou[1,2]

[1]*ENAL Electromagnetics and Novel Applications Lab, Department of Electrical and Computer Engineering, University of Cyprus, Nicosia, 1678, Cyprus*
[2]*FOSS Research Centre for Sustainable Energy, Department of Electrical and Computer Engineering, University of Cyprus, Nicosia, 1678, Cyprus*
[3] *Advanced Center for Research and Development in Experimental Medicine (CEMEX), Grigore T. Popa Medicine and Pharmacy University of Iasi, Str. M. Kogalniceanu, nr. 9-13, 707557 Iasi, Romania*
[4]*Iasi Plasma Advanced Research Center (IPARC), Faculty of Physics, Alexandru Ioan Cuza University of Iasi, Iasi 700506, Romania*
[5]*Integrated Center of Environmental Science Studies in the North-Eastern Development Region (CERNESIM), Alexandru Ioan Cuza University of Iasi, Iasi 700506, Romania*

E-mail: anastassiou2@gmail.com, ionut.topala@uaic.ro

Atmospheric pressure plasma jets (APPJ) show great potential for biomedical applications [1]–[3]. One of the most interesting applications is cancer treatment where APPJ was used effectively in a number of different types of cancer and in some cases it even exhibited selectivity in treating the disease while leaving the healthy tissue intact [4]. One of the newest developments is plasma enhanced chemotherapy (PEC) where CAP is used synergistically with chemotherapy [5]. PEC promises not only to make chemotherapy more effective (achieving the same results with lower drug doses) but also to enable therapy on resistant cancers. Being able to reduce the drug dose and still offer an effective treatment can have significant implications on the patient by limiting the harmful side effects of chemotherapy. In addition, PEC can allow for the treatment of previously untreated cancer.
In this work two healthy cell lines (MCF-12F and MCF-10A) and two cancerous lines (MCF-7F and MDA-MB-231) are treated with various doses of Camptothecin and plasma jet (generated using a capillary glass tube with internal diameter of 4 mm) ignited by at 6.0 kV, 30 μs duration, 15 kHz pulses. The goal is to show how the combination of drugs and APPJ work in synergy (similar to the well-established method of electrochemotherapy) and not just in an additive way. In the synergetic way, it is expected that APPJ causes the cells to be more permeable and more absorptive of chemotherapy drugs. The cell viability is determined through various means including MTT assay and flow cytometry.

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