COLD ATMOSPHERIC PLASMA JET BIOCOMPATIBILITY WITH EPITHELIAL CELLS

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1. Introduction

Cold atmospheric pressure plasma jets (APPJs) are capable of generating plasma plumes in open space rather than plasmas confined by physical walls. The resulting plasma jet propagates into the surrounding ambient and interacts with air molecules creating reactive oxygen and nitrogen species. These active species can cause surface functionalization and decontamination. Plasma sources intended for medical treatments should be capable of providing selective inactivation of microbial strains leaving intact the surrounding healthy tissues [1]. Therefore, the aim of this study was to evaluate the viability of epithelial cells (Vero-cell), *in vitro*, after plasma treatment for 1 to 5 minutes.

2. Experimental

The present work deals with a remote plasma jet system that consists of a 2.3-mm-diameter copper rod centered into a closed-end quartz tube and connected to a Minipuls4 AC power supply (GBS Elektronik GmbH, Germany). This primary dielectric barrier discharge (DBD) generates plasma inside a syringe-like dielectric enclosure, which is connected to a 1.0-m-long plastic tube equipped with a conductive wire at floating potential. The wire tip penetrated few millimeters inside the DBD reactor and serves as an electrode. When the discharge is ignited in the DBD reactor, a remote plasma jet is generated at the end of the long plastic tube [2]. A schematic diagram of the experimental setup used in this study is presented in Figure 1.

Epithelial cells (Vero) in a concentration of $6x10^6$ cells/well were plated in a microtiter plate, 24 hs before the experiment. The system was fed with helium at a flow rate of 2.0 SLM and powered by an amplitude modulated sine-wave signal with 14 kV amplitude and duty cycle of 0.21%. The distance between nozzle and cells was kept fixed at 15 mm and the treatments were performed for 1, 3 and 5 min.

The cells viability was verified via MTT assay (3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyl tetrazolium bromide) immediately, 24 and 48 hours after treatments. Viability of cells not exposed to plasma was considered 100 % for viability percentage determination in treated groups.

3. Results and Discussions

Plasma jet exposure maintained intact the epithelial-cells viability in all studied groups (immediately, 24 hours and 48 hours after the process). The results shown in Figure 2 suggest that the tested plasma jet can be applied to epithelial cells for 1, 3 or 5 minutes without causing loss of cells viability.

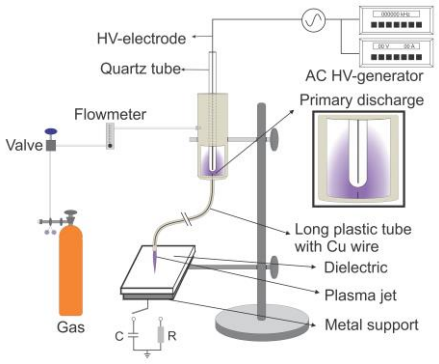

Fig. 1. *Schematic drawing of the experimental setup.*

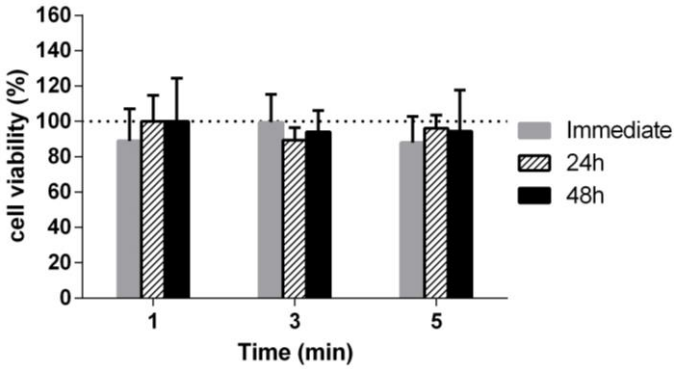

Fig. 2. *Percentage of viable cells immediately, 24hs and 48hs after plasma treatment (average±SD).*

4. References

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