Air DBD plasma selective effects on different cell lines

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Cold plasmas at low/atmospheric pressure are widely utilized since almost 50 years to modify the surface of biomaterials with the aim of driving the interactions of proteins, cells, and biological tissues with materials in devices used in the biomedical field.
Furthermore, in the last ten years the use of plasma processes to directly treat living tissues was successful in different therapeutic field such as sterilization and decontamination of wounds, wound healing, blood coagulation and treatment of cancer[1,2].Such interactions can involve lethal or positive effects on living cell. In order to understand the mechanisms underlying the different interaction between plasma and eukaryotic cells, *in vitro* experiments with cell lines represent a very powerful tool.
In this work the selective effects of different doses of DBD (Dieletric Barrier Discharge) air plasma on different cell lines, an immortal one, SAOS-2 osteoblastoma, and a primary one, NHDF fibroblasts, was investigated.
In the home made plasma source discharges were operated in air and in pulsed mode, with cells positioned on the bottom of a Petri dish which works as dieletric of the ground DBD electrode.
Process with different number of pulse, respectively 1,3,9 and 27 pulse it was performed.
At 24h and 72h, after plasma exposure, cell proliferation and cell morphology on the different Petri dish was compared with that of control (untreated) cells by means of biological tests.
Atmospheric plasma discharges applied on the two selected cell lines have shown an effect strongly dependent on cell type. We observed a stimulating plasma effect for NHDF cells at low number of pulses which probably means that low doses of plasma generated species, e.g. oxygen and nitrogen reactive species, may induce positive effects in growth, proliferation and behaviour on this particular cell line. On the other side, an inhibition of cell adhesion and growth on the Saos 2 osteoblastoma cell line, directly dependent on the plasma doses, was clear.
Moreover, a gene expression study on SAOS-2 cells has shown an over expression of the heat shock proteins gene HSP 70 A when cells were exposed to a high dose of plasma.
The obtained results demonstrate that by properly tuning the dose of exposure of cells to air plasma it could be possible to stimulate in different cell types selective effects on cell growth, that would in turn be useful in several branches of Medicine as treatment of cancer and tissue regeneration.

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References

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