International Workshop on Plasma for Cancer Treatment

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6th International Workshop on Plasma for Cancer Treatment - IWPCT 2019

Welcome

We are delighted to welcome you to the Sixth International Workshop on Plasma for Cancer Treatment (**IWPCT 2019**), which will be held in Antwerp, Belgium, **April 1 – 3, 2019**. Researchers from around the world will attend to discuss their latest developments for cancer plasma therapy.

A special issue in IEEE Transactions on Radiation and Plasma Medicine will be organised, based on the invited lectures and other contributions to the workshop, with David Graves as special issue editor. The submission deadline will be end of June 2019.

Prof. Dr. Annemie Bogaerts & Prof. Dr. Evelien Smits
Chair and Co-Chair of IWPCT 2019

Scope of the workshop

The topics covered by the Workshop are the following:

- Plasma sources and plasma equipment used for cancer treatment;
- Plasma-cancer interactions: experiments, modeling and simulation;
- Destruction of cancer cells by plasma;
- Mechanisms of plasma selectivity towards cancer cells;
- Plasma-liquid interaction / plasma chemistry in biological liquids / plasma activated media for cancer treatment;
- Clinical and animal studies of cancer treatment by plasma.

Previous workshops in this series

IWPCT 2014: Washington D.C., U.S.A. - 25-26 March 2014
IWPCT 2015: Nagoya, Japan - 16-17 March 2015
IWPCT 2016: Washington D.C., U.S.A. - 11-12 April 2016 - IWPCT 2016 video
IWPCT 2017: Paris, France - 27-28 March 2017
IWPCT 2018: Greifswald, Germany - 21-22 March 2018 -IWPCT 2018 video

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Workshop secretariat

IWPCT 2019
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THE EFFECT OF PLASMA ACTIVATED MEDIUM ON CELL CYCLE AND CELL DEATH IN CANCER AND NON-CANCER CELLS

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The attention of many recent studies has been focused on applications of non-thermal atmospheric pressure plasma for several biomedical purposes – disinfection, wound healing and cancer treatment [1]. Very promising results have been shown both *in vitro* and *in vivo*, however, the exact mechanism of plasma interaction with cells is not yet fully clarified. In plasma cancer treatment, the most important effect of this interaction is the plasma-induced apoptosis, which already has been observed when plasma treatment was correctly set and dosed [2].

The objective of this study is to investigate the effect of plasma activated medium (PAM) on the cell cycle and the cell death in two different human cell lines *in vitro*. We used human melanoma epithelial cell line A375 and human primary embryonic kidney cell line HEK293T. The both cell lines were cultivated in DMEM cell growth medium supplemented with 10% fetal bovine serum without antibiotics in 95% humidified atmosphere with 5% CO_2 at 37°C. After 24-hour cultivation from seeding onto plates, the medium was changed for PAM. For plasma activation of medium, we used two different DC-driven self-pulsing plasma discharges generated in ambient air – streamer corona and transient spark. The effect of the different medium activation times (0.5 min/ml, 1 min/ml) and added volumes in combination with different cell numbers were analysed. Previously, we demonstrated the viability reduction (measured by metabolic MTT test) of both studied cell lines as a function of PAM treatment discharge type and time per volume. At very delicate treatment parameters, moderate reduction of viability of cancer cells while activation of healthy cells can be achieved with the same PAM [2].

The cell cycle belongs to the most important basic processes in human cells, it is strictly controlled and leads to the cell growth and division. Cell cycle arrest was observed by direct plasma treatment in several human cancer cell lines [3]. In this study, the cell cycle analysis was performed using nuclear DNA staining with propium iodide, which distinguished cells in three cycle stages G0/G1, S, G2/M. In our work, we focused on the indirect plasma treatment with PAM and two mechanisms decreasing the cell activity of cancer and non-cancer cells – cell cycle arrest and cell cycle death. The results and also work with human primary keratinocytes HEKa are under progress.

One of the most relevant mechanisms of action of anticancer treatments is the induction of apoptosis in cancer cells, because this programmed cell death does not cause significant inflammatory response in the surrounding tissue [4]. The ability of plasma and PAM to decrease cell viability had been shown in many studies, thus, we investigated the efficiency of PAM to induce apoptosis by Muse Annexin V & Dead Cell Kit. The assay is based on the detection of phosphatidylserine expressed on the surface of apoptotic cell using fluorescent annexin V and dead cell dye 7-ADD. With the assay, it is possible to recognise live, early apoptotic, late apoptotic and dead cells. Induction of apoptosis is an important issue in cancer treatment, because cancer cells have often the ability to block apoptosis, and investigating cell cycle helps to better understand the background of plasma effect on the cells. Because of limitations in the current cancer therapies, novel methods are required. Direct and indirect plasma treatment belongs to the new promising ones.

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References

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