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# Plasma Processes and Cancer - Special Topical Cluster of the 2nd IWPCCT Meeting

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# Plasma Processes and Cancer – Special Topical Cluster of the 2<sup>nd</sup> IWPCT Meeting

Although the emerging multidisciplinary field of plasma medicine has been around for nearly two decades important advances have already taken place that could one day revolutionize healthcare and the way various challenging diseases can be treated.<sup>[1–3]</sup> Amongst these advances the effects of low temperature plasma (LTP) on cancer cells *in vitro* and *in vivo* stand out.<sup>[4–13]</sup> Current cancer treatment modalities, such as chemotherapy and radiation therapy, have serious side effects and tend to lose their benefits to the patients after a while. Therefore, novel and improved therapies that can be used alone or in conjunction with other methods are always sought after by the medical community. LTP is proving to be one such possibility. Mounting experimental evidence is showing that LTP acts on cancer cells and tumors via the reactive oxygen species (ROS) and reactive nitrogen species (RNS) it produces. These chemically reactive species which include O, O<sub>2</sub><sup>-</sup>, OH, H<sub>2</sub>O<sub>2</sub>, NO, NO<sub>2</sub><sup>-</sup>, and NO<sub>3</sub><sup>-</sup> exhibit strong oxidative properties and/or trigger signaling pathways in biological cells that could lead to cell death by necrosis or apoptosis. In addition, several investigators have reported that LTP targets cancer cells in a selective manner, mostly sparing their healthy counterparts. This is an important finding that can play a crucial role in the acceptance of plasma technology as a safe and hopefully successful cancer treatment modality.

In order to offer an opportunity for researchers investigating the cancer applications of LTP to meet, present their latest results, exchange ideas, and establish collaborations, the

International Workshop on Plasma for Cancer Treatment (IWPCT) was established. The first edition of IWPCT (IWPCT-1) was organized by Profs. M. Laroussi and M. Keidar and was held in Washington DC in 2014. The second edition of IWPCT (IWPCT-2) was held in Nagoya University in 2015 and was chaired by Prof. M. Hori. Twenty (20) invited papers were delivered at this meeting along with 61 posters presentations. Researchers hailing from 11 countries attended IWPCT-2, which allowed for excellent exchange of ideas and networking opportunities. Most interestingly two presentations reporting for the first time on two clinical/human trials using plasma jets were presented by Dr. Metelmann from Germany and Dr. J. Canady from the USA. The cancers cases thus treated were head-neck cancers and colorectal cancer, respectively.

This cluster issue of Plasma Processes and Polymers contains several papers that are inspired from the talks that were given at IWPCT-2. These papers report on interesting new developments in the field including the eradication of melanoma cells *in vivo*, the use of LTP synergistically with a cancer drug to inhibit cancer cells proliferation, the combination of LTP and gold nanoparticles to kill glioblastoma cells, and the use of LTP to stimulate the immune system to fight cancer.

The guest editors would like to thank Managing Editor, Dr. Renate Forch, for coordinating the special issue with great care and enthusiasm. In addition, the guest editors express their gratitude to the reviewers who invested time and effort in ensuring that the manuscripts are of the highest scientific quality. Lastly, we would like to

thank the authors for their valuable contributions to this cluster issue.

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