8th International Conference on Plasma Medicine
June 14~19, 2020 / Songdo Convensia, Incheon, Korea

Selectivity of detection methods for reactive oxygen and nitrogen species in plasma treated aqueous solutions

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Discharges generated in air or in gases with admixtures of nitrogen and oxygen produce various reactive oxygen and nitrogen species (RONS), which may have different biomedical effects, e.g. antibacterial/cytotoxic or therapeutic [1]. The effects of cold plasma can also be mediated through plasma treated solutions (PAW/PAM), which are formed during the plasma exposure of various aqueous solutions or cell culture media. Their properties are time-variable, depending on their chemical composition, pH or temperature and may decay exponentially in post-discharge time. For every application of PAW/PAM it is important to know their properties and limitations, which can only be determined by the accurate detection of every single RONS. However, the RONS detection may be often difficult. Some methods for detection of different RONS referred in the literature and known from biology or analytical chemistry, were adopted for the detection of aqueous RONS in PAW/PAM. In general, the detection of some reactive species might be difficult due to their high reactivity, short life time, low concentrations and possible interferences with the chemosensors, reagents or dyes. A knowledge of the reactivity of used dyes and reagents with different oxidants and eventually a proper use of scavengers and inhibitors of reactive species is required. The most commonly used colorimetric and fluorescent methods have some limitations which have to be considered during the process of the evaluation of experimental results. All pros and cons should be taken in account when selecting the proper method for detection of aqueous RONS in PAW/PAM. However, for many methods it is not clear, whether they are suitable to be used in such a specific conditions of PAW/PAM. In our work, we investigated in more details the suitability and selectivity of three methods for detection of aqueous RONS – a fluorometric H_2DCFDA assay for peroxynitrite detection, and colorimetric Griess assay for NO_2^- and Indigo blue assay for dissolved O_3 detection [2-3].

This work was supported by the Czech Science Foundation (GAČR 19-25026S) and Slovak Research and Development Agency (APVV-17-0382).

References

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