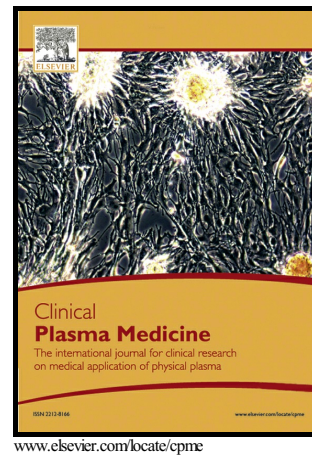


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Human health risk evaluation of a microwave-driven atmospheric plasma jet as medical device

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Abstract

The aim of this study was the characterisation of a microwave-driven atmospheric plasma jet (APJ) dedicated for medical applications. The scientific focus includes harmless sterilization of surfaces and therapeutic treatments in dentistry. Therefore, the plasma was investigated with respect to potential health risks for human beings, which could occur especially by the gas temperature, heat flow, patient leakage current, UV emission and ozone emission from the plasma jet, according to DIN SPEC 91315:2014-06 (General requirements for plasma sources in medicine) [1].

In summary, the results of the experiments indicate a high potential of the plasma jet to be used as a medical device exhibiting low gas temperatures up to 34 °C. The calculated leakage currents are mostly below the 10 µA threshold. The limiting UV exposure duration for the APJ with a calculated maximum effective irradiance of 2.6 µW/cm² is around 19 min, based on the exposure limits of the international commission on non-ionizing radiation protection guidelines (ICNIRP) [2]. A significant ozone concentration was observed mainly in the axial effluent gas flow. Ozone concentration strongly decreases with increasing distance from the plasma source exit nozzle.

Keywords: atmospheric plasma, plasma medicine

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