

Investigation of the effects of atmospheric pressure cold plasma on human cells and tissues

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Atmospheric pressure cold plasma (APCP) is a novel tool in medicine for tissue disinfection. We recently reported that 2 minutes of APCP generated by a new portable device that ionizes a flow of helium gas exerted an antimicrobial effect, mainly due to the action of reactive oxygen species (ROS) (P. Brun et al., 2012). Since ROS induced DNA lesions that could lead to point mutations, before using plasma in medical treatment it is important to ascertain the safe usage of this device.

In the study presented, we analysed the presence of ROS levels, pre-mutagenic 8-oxodeoxyguanosine (8-OHdG) and the expression of OGG1, a DNA glycosylase specific for the removal of 8-OHdG lesions in cell (fibroblasts and keratocytes) cultures.

ROS levels in APCP-exposed microorganisms and keratocytes were detected by 2',7'-dichlorofluorescein diacetate (HDCF-DA) fluorescence; the potential genotoxic effects of plasma were evaluated by analyses of cell cycle distribution, externalization of phosphatidylserine, HPLC determination of 8-OHdG expression, qRT-PCR and Western blotting of OGG1 gene and protein, at set time intervals.

Our results demonstrated that APCP induced ROS formation in exposed human cells, a transient 8-OHdG expression and a consequent adaptative OGG1 response at the transcriptional and translational level.

In conclusion, the short application of APCP to cells and tissues has a disinfection effect and leads to time-restricted ROS generation and to oxidative-stress related responses.

Keywords: Atmospheric pressure cold plasma, ROS, 8-OHdG expression.