The Effects of Air and Nitrogen Plasma Jets on Living Cancer Cells

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The atmospheric-pressure plasma has been proposed as a novel therapeutics for anticancer treatment. Recently, G. J. Kim et al. and K. Kim et al. reported that atmospheric-pressure air plasma jet and nitrogen plasma jet induce apoptosis of cancer cells via generating DNA damages[1][2]. And S. Kalghatgi et al. reported that the air plasma induce apoptosis via generation of ROS[3]. In this paper, we report the effect of ROS scavenger and evaluate the effects of nitrogen plasma jet and air plasma jet on living cancer cells.

In order to ascertain whether the ROS generated by plasma jets are implicated in plasma-mediated apoptosis, we treated HeLa cells with antioxidant scavengers and exposed the cells to plasma jet for 5 minutes. The results of cell analysis by FACs are shown in Fig. 1, which illustrates that the removal of ROS impedes plasma-induced cell death and that ROS mediate the plasma-induced apoptosis. Furthermore, the blocking effect of carboxy-PTIO (scavenger of NO) and sodium pyruvate(scavenger of H_2O_2) in the cells treated with air plasma is stronger than in the cells treated with nitrogen plasma. In consideration of the fact that the effectiveness of ROS scavenger depends on the gas generating the plasma, we form a hypothesis that the composition of ROS in the plasma differs depending on the gas generating the plasma jet. The hypothesis is supported by OES of plasma jet. The dominant peaks of air plasma spectra are different from the peaks of nitrogen plasma spectra. The different peaks in spectra prove that the air plasma and the nitrogen plasma generate different compositions of ROS as by-products of plasma.

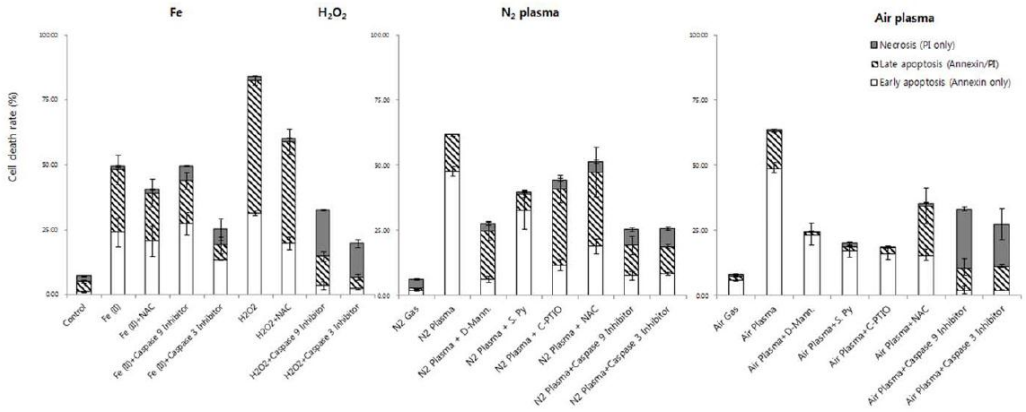

Figure 1: *The results of cell death rate after plasma jet treatment for 5min.*

References

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