Differential Apoptosis Effects of DBD Plasma on Normal and Cancer Cells

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The non-thermal plasma has attracted medical researchers, since they showed higher apoptosis and DNA damageratein cancer cells and normal cells but molecular mechanism is unclear [1][2]. Recent progress in cold plasma jet has selectively eliminates cancer cells without damaging normal cells [3]. Therefore, this research proposes a comparison of dielectric barrier discharge (DBD) plasma effect on three kinds of normal cells lines and cancer cells lines, respectively. We measured the cell number, the mitochondrial activity (MTS assay), the amount of hydrogen peroxide (H_2O_2) and the mRNA expression level of apoptosis-related genes including p53, H2AX, caspase8, ataxia telangiectasia-mutated (ATM). The results show that the cell number, mitochondrial activities and amounts of H_2O_2 of cancer cells decreased more than normal cells after the plasma exposure except MCF7. In case of apoptosis-related genes, ATM and caspase8 were highly expressed in all cells, but p53 and H2AX were reduced or increased according to the cell types. The MRC5 and MCF7 are found to show lowered expression level of p53 and H2AX, which demonstrated almost similar growth rate, mitochondrial activity and H_2O_2 quantity. In addition, we found that DBD plasma exposure on cell suspension in media and media only have illustrated no difference in mitochondria activity, H_2O_2 quantity, and cell number. Thus, we can confirm that the DBD plasma generally induces higher apoptosis in cancer cells. The related molecular mechanisms such as NADPH oxidase will be investigated further.

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References

[1]Kim K., Choi JD., Hong YC., Kim G., Noh EJ., Lee JS., Yang SS., Applied Physics Letters (2011), **98,**073701.
[2]Kalghatgi S., Kelly, CM., Cerchar E., Torabi B., Alekseev O., Fridman A., Friedman G., Azizkhan-Clifford J., PLoS ONE (2011), **6(1),**e16270.
[3]Keidar M., Walk R., Shashurin A., Srinivasan P., Sandler A., Dasgupta S., Ravi R., Guerrero-Preston R., Trink B., British Journal of Cancer (2011), **105,**1295-1301.