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Investigate the apoptotic mechanism of melanoma induced by non-thermal atmospheric pressure boi-compatible plasma activated media

Ying Li[1], Eun Ha Choi[1,2], Ihn Han[2,*]

[2]Department of Electrical and Biological Physics, Kwangwoon University, Seoul, 01897, Korea.

[1]Plasma Bioscience Research Center, Kwangwoon University, Seoul, 01897, Korea

[*]Correspondence to I.H. (email: hanihn@kw.ac.kr)

*This author contributed equally to this work

Melanoma is the most dangerous type of skin cancer, which mostly related with the exposure of ultraviolet (UV), and especially happened to those who have low skin pigment levels. Epidemiological studies showed Europeans and North Americans have a high incidence of melanoma, while it is less common in Asia and Africa. Therefore, the new and more effective methods to treat melanoma are still necessarily needed.

Non-thermal atmospheric pressure bio-compatible plasma (NBP) is defined as a partially ionized gas with electrically charged particle, which has been reported have cytotoxicity on various cancer cells induce DNA damage and apoptosis other than normal cells. Reactive oxygen and/or nitrogen species (RONS) were proved to play the most important role during this process, by inducing oxidative stress and depolarization of mitochondria membrane potential with the consequence of various cancer cells apoptosis.

The plasma activated media (PAM), which the media treated directly by NBP with different time, containing mostly long-live secondary species such as hydrogen peroxide (H_2O_2) which have been confirmed anti-microorganism and cytotoxic activity. Researches already investigated that PAM also effective in cancer therapy via inducing apoptosis. However, the underlying molecular mechanisms of apoptosis are remaining elusive.

The purpose of this study was to evaluate the potential of PAM as an effective tool to induce apoptosis in melanoma cells. Our results showed that PAM has a killing effect to melanoma cells in a time-dependent manner, for 3minutes treatment could induce almost 40% cells entry death, after treated by 5 minutes more than 60%, and 10 minutes treatment reduced the cell viability to approximately 30%. Annexin-V/PI staining demonstrated that PAM kills these cells via apoptosis pathway. We also found that with a manner of treatment time PAM significantly increased the concentration of intracellular NO and H_2O_2, reflecting an influx of extracellular RONS may result in melanoma cells apoptosis. Besides, western blot assay showed that P53 and caspase 3 increased after PAM treatment. Taken together, PAM is effective to induce the apoptosis in melanoma cells in vitro, further in vivo experiments will be performed to investigate the functional effects in the animals.