Plasma gas temperature effect on survival ratio of human cells

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In recent years, atmospheric non-thermal plasma sources have attracted much attention in medical field because of its effectiveness for sterilization of medical devices and wound area. Previously, obvious difference of sterilization effect changing plasma gas species was observed [1]. It is expected as effective sterilization of medical devices or human body.

Note that plasma gas temperature should be sufficiently considered, if targets are sensitive to temperature such as human cell (required below 43℃). Because atmospheric pressure plasma source generates plasma by an electrical discharge through a gas supplied at around room temperature and the gas temperature of the generated plasma is somewhat higher than room temperature. Conventionally, to bring plasma irradiation to human cells, input power of plasma generation should be reduced.

In our laboratory, new plasma generation system in which the gas temperature of the plasma can be accurately controlled from below freezing point up to a high temperature without reducing power have been developed [2]. Using this system, survival ratio of plasma irradiated HeLa cells was observed under gas temperature variation of helium plasma. The helium plasma gas flow rate was 5 slm and electrode was connected to power supply with a frequency of 16 kHz and high voltage of 9 kV. As shown in Figure 1, plasma of high gas temperature (over 43℃) killed human cell at 60 s. Taking this point carefully into account, biological effect was investigated by various gas plasmas at room temperature. The details of the plasma source and the results of these experiments will be presented.

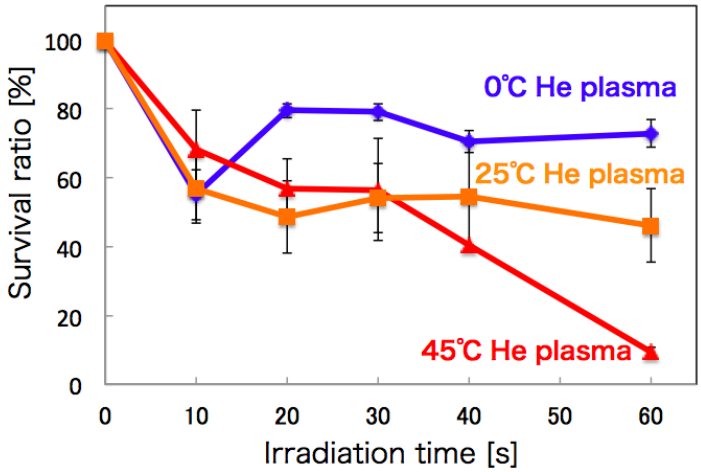

Figure 1: *Survival rate of HeLa cell*

References

[1] Takamatsu T, Ichikawa M, Hirai H, Sasaki R, Shibata M, Miyahara H, Matsumoto Y and Okino A 2011 *38th IEEE Int. Conf. on Plasma Science* (Philadelphia, USA) IP2H-23
[2] Oshita T, Takamatsu T, Sasaki R, Nakashima N, Miyahara H and Okino A 2011 *Plasma Conf.* (Ishikawa, Japan) 22P036-P