

Effects of nitrous acid and nitric acid in an air-water plasma system on HeLa cell viability

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A air-water plasma system generates many chemical species such as ozone, nitrogen oxides and reactive species in air. Those species dissolve and react in water and produce stable chemical species such as hydrogen peroxide, nitrous acid and nitric acid which are transported due to their long life span [1]. Authors have been clarified the effect of hydrogen peroxide on HeLa cell viability in an air-water plasma system. Similar trends in biological reactions of HeLa cells were obtained in both plasma treated and hydrogen peroxide added culture media with respect to cell survival ratio, morphological damage process, ROS production in cells, response to catalase treatment, and comprehensive gene expression. Those results proved that hydrogen peroxide is the main inactivation factor of HeLa cell viability [2]. However, effects of nitrous acid and nitric acid are also important in the case of greater concentration. In the present research, we aimed at clarifying the effect of those species on HeLa cell viability using culture media supplemented with nitrous and nitric acids at a concentration up to 10 mM. Figure 1 shows trypan-blue staining of the cells cultured with nitrous acid (a) and nitric acid (b). The cells died with 10 mM nitrous acid (positive staining), whereas they survived with 10 mM nitric acid (negative staining). Cell responses for oxidation stresses were also investigated in this research.

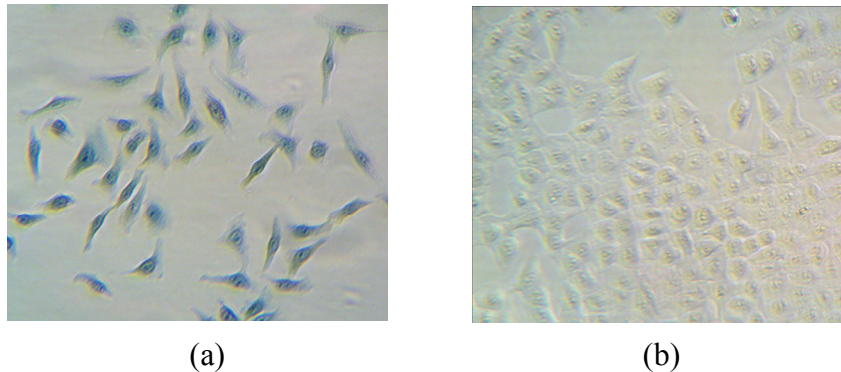


Figure 1: Trypan-blue staining images of HeLa cells incubated for 48 hours with 10 mM nitrous acid (a) or 10 mM nitric acid (b) added culture medium.

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References

- [1] Shimizu T., Iwafuchi Y., Gregor E Morfill., Sato T., *New Journal of Physics*, **13** (2011), 053025.
- [2] Sato T., Yokoyama M., Johkura K., *Journal of Physics D: Applied Physics*, **44** (2011), 372001