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Plasma Biomedicine: Modelings and Experiments on Cancer Treatment, Tooth Bleaching, and Decontamination

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Non-thermal atmospheric pressure plasmas have attracted great interests and been widely used in biomedical applications to interact with living tissue, cell, and bacteria. Gold nanoparticles conjugated with anti-FAK antibody have been introduced to cancerous cells to enhance selective killing of cancerous and normal cells, and the mechanism of cell apoptosis induced by plasma has been investigated [1,2]. Tooth exposed to helium plasma jet with hydrogen peroxide or alike has become brighter and the production of hydroxyl radicals decomposed from hydrogen peroxide have been enhanced by plasma exposure [3]. Sterilization by non-thermal plasma devices and the global and PIC modelings of these plasmas will also be presented.

[1] G. C. Kim, et al., "Air plasma coupled with antibody-conjugated nanoparticles: a new weapon against cancer," *J. Phys. D: Appl. Phys.* 42, 032005 (2009); *Plasma Medicine* (to appear); *Europhysics News* 40/2, 14 (2009).
[2] G. J. Kim, et al., "DNA damage and mitochondria dysfunction in cell apoptosis induced by nonthermal air plasma," *Appl. Phys. Lett.* **96**, 021502 (2010).
[3] H. W. Lee, et al., "Tooth bleaching with nonthermal atmospheric pressure plasma," *J. Endod.* **35**, 587 (2009); Plasma Proc. & Polymers 7, 274 (2010).