Design and Performance Characteristics of a Novel Atmospheric Plasma Device for Biomedical Applications

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Due to the controllability of the physical and chemical parameters, low-temperature atmospheric plasmas find applications across an enormous range of health care procedures [1,2]. To address the most demanding challenges in medicine, it is necessary to develop plasma devices with tightly controlled physical parameters: plasma density and ions energy, intensity of irradiated light and UV, gas flow, operating gas temperature and charged species distributions. We report on designing and testing of a new device for low-temperature atmospheric plasma with adjustable plasma density providing a wide area of homogeneity of the main plasma parameters. The proposed discharge plasma source working at atmospheric pressure is basically similar to the device construction reported in [3]. However, the main distinctive feature of this device is an especial electrode placed on the outer wall of the chamber allowing us to adjust the power adsorbed by the plasma, and therefore change within certain limits the plasma temperature (30 - 55 C), ions density and the intensity of ultraviolet radiation. The performance of the proposed plasma reactor for deactivation of several types of Gram-negative and Gram-negative bacteria cultures was proven by experiments.

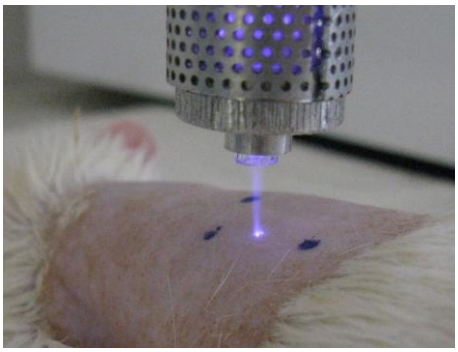

Figure 1: *A device photograph in action. The skin of living rat was exposed to plasma for 15 minutes without any signs of tissue damage or inflammation.*

For the designed plasma generator, we carried out a series of experiments exposed the healthy skin of living rats to study of the plasma effect with the same dose and exposure time as was used to inactivate bacteria. No signs of skin damage or inflammation were observed immediately as well as 2 hours after the plasma exposure (Figure 1). This work is supported by KAN200520804.

References

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