THE ATMOSPHERIC PRESSURE AIR PLASMA JET USE IN BIOMEDICAL APPLICATIONS

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The main field of plasma medicine is the direct application of cold atmospheric plasma on/or in the human body for therapeutic purposes. In this report, we present the experimental results for inactivation of clinically significant microorganisms and their consortiums by air plasma jet at atmospheric pressure.[1] Generation of reactive nitrogen species in DC air plasma jet used in the experiment is dominating [2]. Thus, at dc current of 40 mA and air flow of 5 slm , the concentration of bioactive molecules are NO = 180 ppm, NO2 = 140 ppm, HNO2 = 25 ppm.

In each experiment, the total initial concentrations of monocultures of Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa, Candida albicans, Bacillus subtilis, Proteus mirabilis, Klebsiella pneumonia and their consortiums in Petri dishes are 106 CFU/ml. The temperature of the nutrient media in Petri dish is controlled with the FLIR E4 thermal imager and does not exceed 30 °C. The efficiency of the plasma jet action was estimated from the inhibition zones on Petri dishes and in the concentrations of surviving microorganisms determined by colony counting method.

It is shown that the characteristic D-times inactivation defined as the time interval during of which the number of surviving microorganisms is reduced by 10 times were rather different. Thus, for monocultures of *S. aureus, E. coli, P. aeruginosa, B. subtilis, Kl. pneumonia* the characteristic D-times were the same and were about 1.5 min and had approximately equal inhibition zones (about 50% of the total area of Petri dishes). At the same time, the D-time for for spores of *C. albicans*, eukaryotes *Pr. mirabilis* and consortiums (*S. aur.+E. coli+P. aer.*, *S. aur. +P. aer., E. coli+P. aer., S. aur.+E. coli, S. aur.+E. coli+С.alb.*) exceeded 3 min and had approximately equal inhibition zones 15-25%.

The results of the action of an air plasma jet on the DNA structure are presented. The genotoxic properties of the air plasma jet were estimated *in vitro* in a comet test on the DNA phage λ. It is shown that the action of a plasma jet on DNA for 20 minutes does not lead to its destruction.

This work is partially supported by BRFFR-RFFR under the grant F17RM-050.

Reference.

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2. A.V. Kazak, A.A. Kirillov, I.V. Lipsky, L.V. Simonchik, M.S. Usachonak, In *ESCAMPIG XXIII Proceedings*,*, Bratislava, Slovakia, July 12-16, 2016,* Bratislava, pages 365-366 (2016)