

## **EFFECT OF LIQUID MODIFIED BY NON-EQUILIBRIUM ATMOSPHERIC PRESSURE PLASMAS ON BACTERIA INACTIVATION RATES**

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Several studies compared two dielectric barrier discharge (DBD) plasma treatment regimes and their effect on viable bacteria inactivation e.g. [1, 2]. Significant difference was shown between direct and indirect treatments where plasma either contacts the surface being treated or does not. The sterilization efficiency drops by almost an order of magnitude when plasma is generated remotely (indirectly) [1, 2]. However, this effect was mostly found on uniform surfaces such as agarous gel. In wounds for example, bacteria can often “hide” in pores. Therefore in the case of plasma treatment of wounds and other complex surfaces, irregularities in surface topology prevent effective implementation of direct plasma treatment. In this case, plasma related inactivation effect is believed to be delivered by neutral active species produced by the discharge in liquids (e.g. water, blood, etc.) present at the wound site, i.e. so-called plasma “pharmacological” effect.

In this study we investigate the possibility of bacterial inactivation using “separated” DBD plasma treatment. In contrast to direct and indirect methods, here liquid was first treated with DBD plasma separately, and then after certain time delay was applied to a contaminated surface with irregular topography. This method is compared to direct treatment.

The results show that while direct plasma is more efficient on agar and other relatively flat surfaces, it loses its efficiency on surfaces with pores. Effectiveness and efficiency of “separated” plasma treatment will be presented and potential mechanisms are proposed.

1. G. Friedman et al., “Comparison of Direct and Indirect Effects of Non-Thermal Atmospheric-Pressure Plasma on Bacteria”, *Plasma Process. Polym.* 2007, 4, 370–375
2. D. Dobrynin et al., “Physical and biological mechanisms of direct plasma interaction with living tissue”, 2009 *New J. Phys.* 11 115020 (26pp)