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THE ANTIMICROBIAL EFFECTS OF LOW-TEMPERATURE PLASMA ON SANITARY RELEVANT MICROORGANISMS

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Summary. *The article investigates the antimicrobial effects of low-temperature plasma on sanitary relevant microorganisms, specifically focusing on Staphylococcus aureus strain. The study compares the methods of plasma application, and it is determined that exposing microorganisms on an agar medium surface is the most effective approach. The results demonstrated a predictable exponential reduction in bacterial survival relative to plasma exposure time, confirming the reliability of plasma as an antimicrobial agent for such microorganisms.*

The studies of the properties and possibilities of practical use of modern physicochemical technologies products including plasma environments constitute the most dynamically developing area of science and technology. There is a significant number of investigations that focus on methodological approaches that use protozoan organisms of various taxa as a biological test model to evaluate different plasma generators. This aspect of research is relevant in order to study the mechanisms of the effects of physical agents on biological structures of a range of levels of organization, and in order to achieve antimicrobial effects.

Plasma is considered as the fourth state of matter, excluding solid, liquid and gaseous. In the course of plasma generation, the following are produced: free radicals (including active forms of oxygen and nitrogen), ions, electric fields, ultraviolet radiation. These particles and physical effects justify the antimicrobial use of plasma, causing bactericidal effect based on the oxidation of membranes, cell wall, DNA degradation, etc. [1].

The main criterion for assessing antimicrobial potential is microbial survival rate, which is expressed as a percentage of the initial contamination and is calculated according to the formula:

$$I = \frac{N_t}{N_0} \times 100\,\% \tag{1}$$

where I – survival rate in %;

N_0 – number of test strain cells before plasma exposure, CFU;

N_t – number of test strain cells after plasma exposure for t min, CFU.

There exist several methods for assessing antimicrobial potential. One method is to apply low temperature plasma to a suspension of a test culture of a microorganism in a liquid medium. However, this method has limitations to the effectiveness of plasma exposure because plasma will mainly affect the surface layer of the bacterial suspension. In addition, water will screen the action of plasma, which affects the effectiveness of the procedure. The most adequate method of assessing antimicrobial potential is considered to be the exposure of a population of test microorganism models on the surface of agarose nutrient medium to plasma medium [2].

A modeling experiment was carried out to study the antimicrobial potential of low-temperature plasma against sanitary relevant microorganisms *Staphylococcus aureus.* Gram-positive bacteria *Staphylococcus aureus* was used in the experiment, as *Staphylococcus* are extremely widespread representatives of the microbiome of human skin and mucous membranes, as well as a sanitary indicator of the environment. *Staphylococcus aureus* strain used in our work has typical biochemical characteristics of the species. The results of modeling showed that the format of antimicrobial potential assessment by indicator I chosen in the experimental work allows to obtain reliable quantitative results (figure 1).

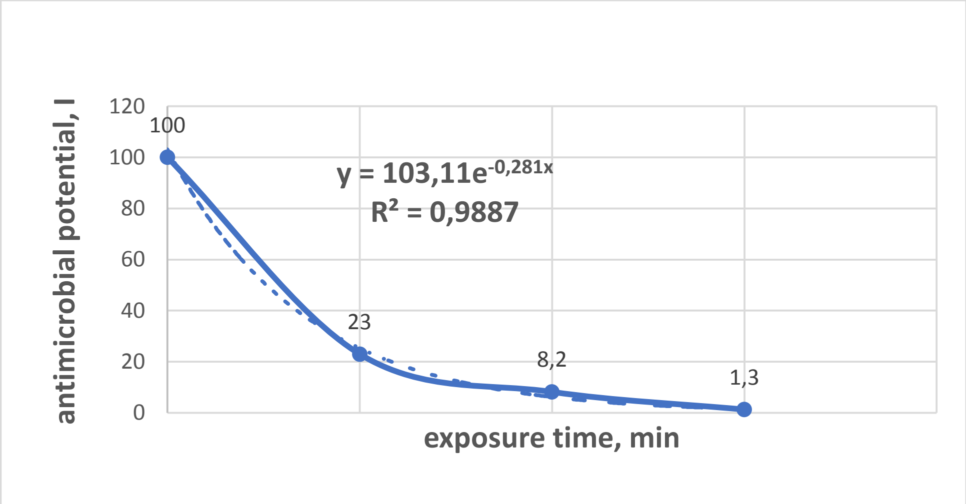

Figure 1 – Dependence of antimicrobial potential of plasma on time of exposure to *Staphylococcus aureus* population

A regular dependence of the efficiency of plasma exposure on the time of exposure to the population of test microorganisms *Staphylococcus aureus* was obtained, which was described by an exponential function. The approximation coefficient of 0.9887 allows one to conclude that the chosen mathematical model describes the obtained dependence with a high degree of reliability.

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THE ROLE OF SINGLE NUCLEOTIDE VARIANTS (SNVS) IN GENOMIC INNOVATION

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Summary. *Single nucleotide variants (SNVs) represent the most common type of genetic variation, with significant applications in genomic research, disease understanding, and personalized medicine. This paper discusses the role of SNVs in modern research and technological advances, particularly in the development of diagnostic and therapeutic innovations.*

Single nucleotide variants (SNVs) refer to variations in a single nucleotide that occur at a specific position in the genome. SNVs are pivotal in understanding genetic diversity and are linked to numerous inherited traits and diseases.