Non-contact determination of biological activity of liquid media using growth kinetics Escherichia coli.

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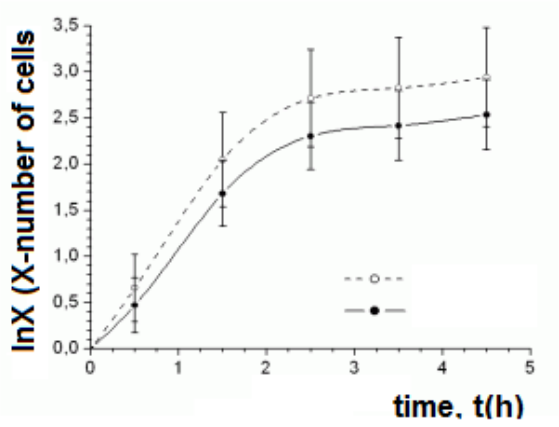
Back in the mid-70s. of the last century, sufficiently convincing data were obtained on the biological effect of electrochemically activated weak solutions [1-3]. However, there is still no unified theory describing processes in activated solutions [1, 3]. And despite the insufficient knowledge of these important mechanisms, the biological activity of various activated liquid media is already widely and effectively used not only in everyday life, but also in medicine [2].

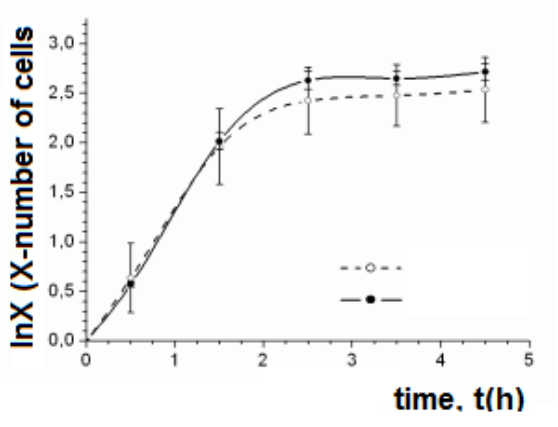
The presence of traces of various effects on water is most reliably detected not when analyzing the "static" properties of water, but when studying the processes occurring in it or its influence on biological objects. The paper presents a series of experiments on the effect of non-contact activated (BA) in an electrolyzer without a diaphragm of the nutrient medium on Escherichia coli. This well-studied object can be considered the most convenient in the research of contact and non-contact activated media for a number of properties: high sensitivity to slight changes in the environment, high speed of reproduction, low demand, availability, etc.

In an electrolyzer without a diaphragm, contact activation of weakly mineralized water was carried out - less than 150 mg / l (hereinafter "solution") until a significant change in ORP (Red-Ox potential): from +250 mV to -270 15 mV (CSE). Immediately after the cessation of activation (turning off the current), small thin-walled dielectric containers containing a prepared nutrient medium with viable cells (E. coli) were immersed in the solution (+ 37 ° C). Then, at regular intervals, the parameters in the nutrient medium (ORP, pH, D - optical density) and physical. solution (ORP). The optical density was recorded on a Specord M40 spectrophotometer (Carl Zeiss Jena) in quartz cuvettes with an optical path of 10 mm at a wavelength of 540 nm. In the control, all other things being equal, activation was not carried out, the ORP of the solution remained at a level of + 250 ± 15 mV. E. coli growth dynamics is presented in Pic. 1.

In the second series of experiments, after activation and before immersion of the containers with the studied cell suspension, 15 hours of relaxation of the active solution took place. (Pic 2.)



Pic 1. Influence of non-contact activated nutrient medium on the dynamics of E.coli growth immediately after activation.



Pic 2. Influence of non-contact activated nutrient medium on E.coli growth dynamics after 15 hours of solution relaxation.

After immersion in the activated solution of containers with a nutrient medium, in the latter, the ORP decreases (from + 190 ± 15 to + 33 ± 15 mV) within 15 minutes. Thus, the effect of BA on cells occurs already at the stage of their adaptation to environmental conditions, but during the log-phase of growth it may not manifest itself. Whereas at the stationary stage there is a clear difference between control and experience.

It is known that under different modes and methods of activation, a different biological effect is carried out on the same object [4]. In this work, under the same regime, but with different relaxation times, opposite effects are observed, which is of great interest in connection with the search for a test object for studying processes in activated liquids. The different effect of activated solutions depending on the relaxation time on a complex system (nutrient medium + E. coli) can be quite simply explained within the framework of classical nonlinear physics by supercoherent electromagnetic radiation from resonant microclusters [3].

Our work also confirms the stabilizing effect of activation on living cells [5], which is indicated by the small scatter of data in the experiment as compared to the control.

List of publications:

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4. Miroshnikov A. I, Influence of the treatment regime of catholyte and anolyte of the culture medium on the growth of E. coli cells, Theoretical and experimental research, 2nd International Symposium, Electrochemical activation in medicine, agriculture, industry. - M .; VNIIIMT JSC NPO "Ekran", 1999.

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