

CONTINUOUS CULTIVATION SYSTEM *PHOTOBACTERIUM PHOSPHOREUM* FOR BIOLOGICAL MONITORING OF THE GEOMAGNETIC FIELD

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Luminous bacteria have been used as bio-indicators since the 1950s. There are express methods of quantitative determination of toxicity based on measuring a decrease in luminescence intensity of bacteria after addition of toxic compounds in water samples. Bacterial luminescence is an enzymatic process associated with the general metabolism of the cell. These bacteria contain the luciferase enzyme system responding to the environmental changes. One of the perspective directions of expansion of bioluminescent analysis is its use to assess the degree of biological action of geomagnetic activity.

Daily changes of the Earth's ionosphere sun-illumination cause regular variations in the geomagnetic activity, mainly due to the currents in the Earth's ionosphere. These variations have an impact on the biological objects.

The aim of this work was to study the geomagnetic activity effect on *Photobacterium phosphoreum* IMV B-7071 luminescence intensity in continuous cultivation system.

The luminous marine bacterium *P. phosphoreum* strain IMV B-7071 from the culture collection of the Zabolotny Institute of Microbiology and Virology of the National Academy of Sciences of Ukraine was used in this study. Bacterial biomass was grown for 24 hours at 21°C. The bacterial suspension of the 300 ml volume and 10⁷ cells/ml was used to evaluate specific luminescence intensity at photomultiplier FEU-115. The geomagnetic activity was assessed by the values of the *H* using the data of geophysical monitoring of the Institute of Geophysics of the National Academy of Sciences of Ukraine (<http://geomd.igph.kiev.ua/>).

Experimental correlations exist between daily geomagnetic activity and the specific luminescence intensity showed a statistically significant inverse relationship with a correlation coefficient $R = -0.40$ ($p < 0.001$).

However, study specific impact of geomagnetic field on bacterial luminescence intensity requires automated long-term parallel measurements in real time. For this purpose, a complex for the continuous cultivation of *P. phosphoreum* IMV B-7071 bacteria with high luminescence was created. Biological reactor for continuous cultivation of microorganisms has the ability to maintain a constant intensity of mass transfer processes in the substrate. The rate of medium flow is controlled to keep the culture volume constant. A closed system of pipeline and shut-off valves maintains aseptic cultivation conditions for a long time. Industrial digital multimeter UNI-T UT171A (#H160413239) gave the opportunity to connect personal computer for data registration. Statistical processing of the data set requires the development of special software.

Hourly and daily changes in the geomagnetic activity and luminescence intensity will be analyzed. This will provide the information about the behavior of microorganisms before, during and after a registered geomagnetic storm.