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Toxic effects of radioactive waste components on microbial cells immobilized on biosensor

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During the period of nuclear power facilities in the world, Russian Federation and the United States have accumulated a significant amount of radioactive waste (RW) in liquid form, which contacted with the biosphere in accidental emissions and while being stored in open repositories. Radioactive waste in the environment cause number of toxic effects by ionizing radiation and chemical components, especially nitrate salts in concentrations up to 300 g per liter, oils, EDTA and other chelating agents, and heavy metals. Toxic effects caused by exposure of radioactive waste components are key issues in radioecology and environmental biotechnology, for example, for monitoring nuclear objects after conservation. To assess the toxic effects on ecosystems test model (algae, plants, protozoa, arthropods, fish) are usually used, but such methods are often expensive and long-termed process.

Aim of this paper, is to assess the toxicity of radioactive waste on the ecosystem by electrochemical method based on the respiratory activity of aerobic bacterial cells immobilized on the modified Clark electrode. This method allows to obtain data of the waste components concentration effect on the rate of cellular respiration. Recognizing element (bioreceptor) on the basis of immobilized cells was fixed on the measuring surface of an oxygen electrode Clark type using a nylon mesh Immobilization of cells . For that we use a cell suspension, which contains 10 μg cells . The time of single measurement is 6–8 min.

For work we use aerobic organotrophs bacteria from groundwater samples exposed radioactive waste from PO "Mayak" and Syberian Chemical Combine. Nitrate ions, metals, organic compounds concentration effects on the process of cellular respiration are established.

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