Enzyme-based biosensors based on bacterial bioluminescence for environmental monitoring

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The current situation in biosensors for monitoring of aquatic ecosystems is profoundly analyzed. This analysis is to provide a basis for the conception of creating a universal system of biosensors for ecological monitoring. The approaches to the creation of this system using bioluminescent organisms and their enzymes and to devise a laboratory model of a biosensors system are discussed.

To estimate water quality, original bioluminescent biosensors characterized by rapidity, simplicity, high sensitivity, and accuracy have been devised and successfully used. On the basis of the Collection of Luminous Bacteria IBSO (http://www.bdt.org.br/bdt/msdn/ibso), the integral bioassay for the monitoring of the environment is being developed, using lyophilized luminous bacteria and the luminescent system isolated from them. Bioluminescent assays have an evident advantage over other biological assays: luminescence is easy to measure, the method is rapid, the measurements can be automated, and the data can be statistically processed.

The preliminary results show a correlation between physicochemical characteristics of inhibitor (activator) molecules and changes in kinetic parameters of bioluminescent reaction. Such correlations are closely related to the physical mechanism of bioluminescence; they are a biophysical basis for the bioluminescent ecological monitoring. These data will provide a basis for comparing sensitivities and choosing test organisms and enzymatic systems to be included into the sensors of the automated system of bioassays.

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