**The method for analyzing photoinduced changes in *Rhodobacter sphaeroides* reaction centers in a two-level electron transfer model with time-variable parameters.**

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**The aim** of the work is to determine photoinduced structural changes in isolated Rhodobacter sphaeroides reaction centers using a two-level electron transfer model with time-varying parameters. **Actuality** of the work is that often the reaction of natural objects to external influences is analyzed using balance equations, when the reaction of the object has a multi-exponential character, which can be represented as a sum of exponential components. This kind of reaction can be caused both by the influence of the hidden parameters of the object, connected with the structure, and the influence of the reaction itself on the structure of the object. Their definition is of scientific interest. The problem arises from the fact that the experimental kinetic curves of the basic reaction of the object have noise, and it is often not possible to determine the derivative of the kinetic curve with the required accuracy. **The problem** arises from the fact that the experimental kinetic curves of the main reaction of the object have noise, and it is often not possible to determine the derivative of the kinetic curve with the required accuracy. **The task** was to develop a computer program (Delphi) to obtain an analytical expression of the kinetic curve derivative with high accuracy. This makes it possible to determine the rate constants of the electron return from the acceptor to the oxidized donor in photoexcitation processes of the RC, which characterize the reaction of the reaction center. The values of the energy barrier (Ea) of such a reaction, determined by the derivative of the logarithm of the electron return rate constant from the acceptor to the donor of the reaction center. **As the object**, isolated reaction centers of Rhodobacter sphaeroides bacteria were used, the structure of which has been well studied. The kinetic curves of the RC photoexcitation process were obtained by the method of absorption spectroscopy. To obtain an analytical expression of the kinetic curves, the developed method of decomposition the curves into exponential components was used, using the mutual basis in the calculations. The method was modified by additionally dividing into four parts of the first interval of digitization of the kinetic curves. The final processing of data and the construction of graphs was carried out by the program "OriginPro 9". **As a result,** a computer procedure has been developed for obtaining the parameters of the exponential components of the kinetic curves and their derivatives with high accuracy, both at the stage of illuminating the RC and at the stage of relaxation of the RC after switching off lighting. It is determined that the time dependences of the rate constants of the return of an electron from an acceptor to an oxidized photodonor upon excitation of the reaction center in a semi-logarithmic scale are linear in nature, whose tangent of angle of which increases with increasing intensity of the exciting light. The time dependence of the energy barrier of the reaction is determined, which has a number of characteristic times of 0.1, 3.10 s during excitation of the RC and 0.3, 2.10, 70.200 s with the relaxation of the RC.

**It is concluded** that the features of the time dependences of the rates of electron return rates from the acceptor to the oxidized photo donor, the energy barrier of the reaction center reaction on its photo excitation, characterize the space-time characteristics of the RC.