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The photomodification mechanisms of nucleic acids by the organic dyes

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The purpose of this work is to determine photomodification mechanisms of nucleic acids macromolecules in the aqueous solution by the instrumentality of bounded and unbounded organic dyes.

To reach the aim the following tasks were worked out:

1. To determine nature of interaction between organic dyes molecules of various type and macromolecules of DNA in the aqueous solutions.

2. To define efficiency of generation of singlet oxygen in a system “dye – DNA” at various interactions between macromolecules and dyes.

3. To determine the character of damage of double helix of DNA in a system “dye–DNA” under laser irradiation of visible light or long-wave ultraviolet.

Experimentally determined that intercalation dyes are not available for oxygen molecules and relatively are not comes generators of singlet oxygen. Under continuous low-intensive illumination ($P \leq 1$ mW) by laser emission of visible range ($\lambda = 480 \div 532$ nm) there were no intercalation dyes DNA damages found out. In case of irradiation such systems by high-power laser pulses ($P \geq 10 MW/sm^2$) ones can observe break of double helix. On the basis of such modification mechanism is singlet – singlet energy transfer from high excited levels of dyes molecules on the DNA.

By continuous low-intensive irradiation of laser emission of visible range ($\lambda = 515$ nm) dyes, bounded with external part of macromolecules or either not coupled with those, were found out DNA damages in the form of detachment of nitrogen base guanine from double helix. Modification mechanism based on the chemical reaction of singlet oxygen with DNA.