

CAPABILITIES OF LOW-ENERGY LASER RADIATION IN CORRECTION OF HUMAN ORGANISM PATHOLOGY

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Most probable mechanisms of interaction between the low-energy laser radiation and a human organism are discussed. The main fields of low-energy laser application in medicine are considered.

Great interest in promotion of the phototherapy methods to medical practice is caused by the capability of using lasers, making it possible for clinicians to select and use for therapeutic purposes any portion of visible radiation. Laser therapy allows one to perform corrections of human health at different levels of a human organism, namely, molecular, cellular, organ, and organism.

It is shown in a number of papers^{5,7,11,15,16} that the main objects of laser action can be divided conditionally into three classes. The following objects of immediate irradiation refer to the first class: pathogenic, reflexogenic, projective, intracavitary, intravascular zones and scanning fields; auricular and corporal biologically active points; points of acupuncture of pathogenic, reflexogenic, projective, and intracavitary zones. The objects, representing specific photoacceptors, refer to the second class: catalase, superoxydistase, cytochromium oxide complex, molecular and singlet oxygen, erythrocytes, leukocytes, thrombocytes, and so on. The universal photoacceptors^{4,9,10,11,13,14} refer to the third class: proteins, ferments, phospholipids, amino acids, pigments and bioliquids (plasma, lymph, intracellular water), where the photoabsorption mechanism based on the photoconductive effect has not yet been studied.

The first-class objects could be the aiming points for a laser beam. Selection of these points must be well scientifically substantiated and proved. The objects of the second and third classes are the targets. In this case specific photoacceptors are connected with the processes of the laser radiation absorption at specific resonance frequencies resulting in stable therapeutic effects. Universal photoacceptors are related to local changes in the patient organism important for the vital organs and systems.

The photoacceptors of both types are the initiators, in the patient organism, of the start-up of photobiological reactions whose products of action promote the stimulation of the most important organs and systems, providing their resistance and regenerative capabilities that, in its turn, facilitates the formation of integrated therapeutic effect.

As a result of stimulation, the additional synthesizing of proteins, biologically active elements, and biological substances takes place under laser irradiation (Fig. 1) that causes therapeutic effects such as bactericidal, anti-inflammatory, desensitizing, etc.

In the last few years the papers were published, describing the antitumoral effect of the low-intensity laser radiation.^{6,8} This fact is due to the stimulation of T-system of immunity, an increase of a subsidiary and a decrease of suppresser activity of T-lymphocytes.^{1,2,4,12} The content of a B-lymphocytes is normalized under the effect of the low-energy laser radiation (LELR), the phagocytic activity of neutrophiles increases and the content of lysocyme and the level of complement^{3,14,17} also increases. At the initially low level of natural cells-killers the 1.5 to 3-fold phagocytic activity increase is observed.

In an applied aspect, the promising are studies of the use of laser irradiation as a modifying factor at radiation and chemotherapeutic action on a tumor. Fraction of radio- and chemoresistance hypoxic cells is one of the important factors of stability of a tumor to radiation and chemical action, and the increase of efficiency of radiation and chemotherapy depends on the capability of additional effect on the vascular channel of tumoral tissue. With the use of LELR the local tumoral hyperemia is created, the maximum oxygen effect is used to increase the sensitivity of hypoxic tumoral cells. We observed a 1/3 increase of mitotic activity of tumoral cells, but the rate of tumor growth does not change.⁸ Real increase of mitotic activity of tumoral cells at combined laser action is considered as a favorable prognostic criterion of the decrease in the fraction of the most resistant tumoral cells.

Of interest is the investigation of the effect of low-energy lasers on the dynamics of morphologic variation of tissues related to the type of pretumor (in particular, epithelium dysplasia). The application of laser therapy enables one to obtain the regression of not only slight but also medium and heavy dysplasia, that makes it possible to consider this method as a possible mean of secondary prophylaxis of cancer.

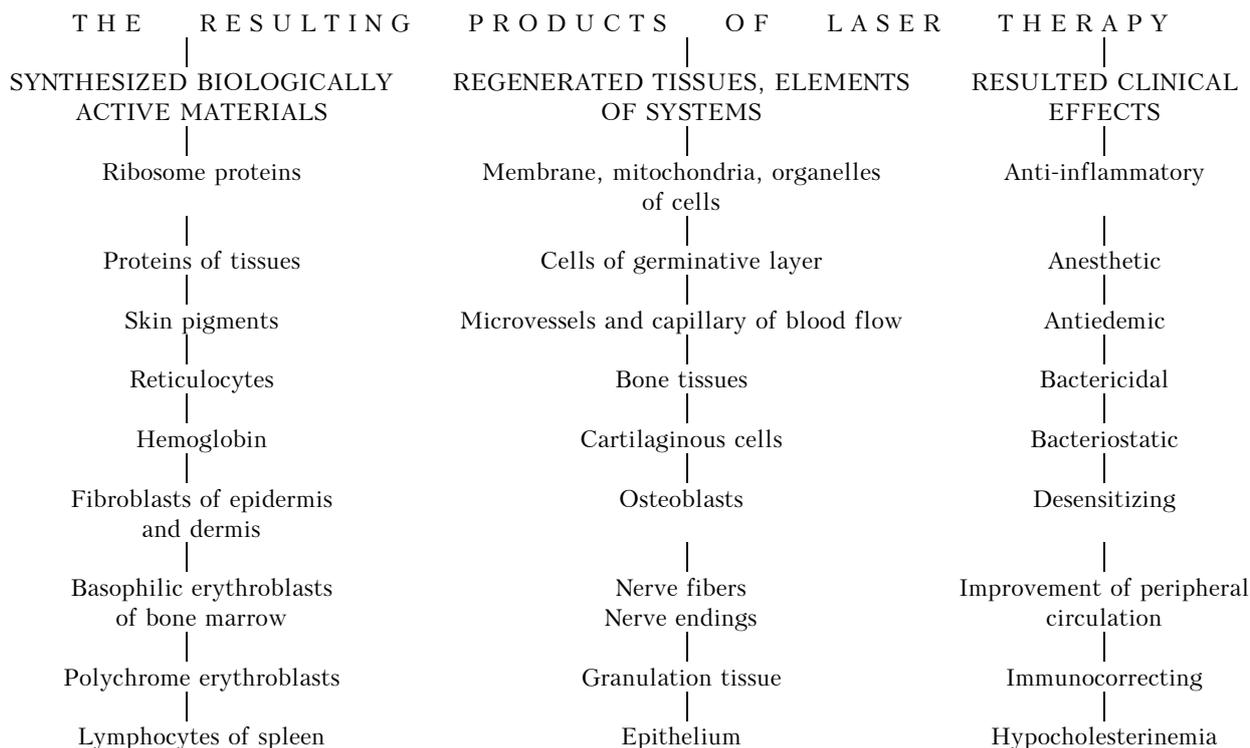


FIG. 1.

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