We applied polarized red or blue light (from Bioptron MedAll devices) to influence the growth of clinical strains of P. aeruginosa, seeded from purulent wounds of patients in the surgical department of Uzhhorod CRC (n=2) and collectible strain P. aeruginosa ATCC 27853 on solid nutrient medium. Daily agar cultures of microorganisms, were adjusted to a standard of turbidity of 0,5 according to McFarland and diluted $6{,}24\times10^6$ times. The resulting suspension was then transferred to sterile Petri dishes 5 cm in diameter and irradiated. Then, cultures in volume of 0.1 ml were transferred to Petri dishes with meat-pepper agar and left at a thermostat of 37°C. In 24 hours, the number of bacterial colonies was recorded and compared with control – similar not radiated cultures. The influence of red and blue irradiation of different exposures (5, 10, 15 and 20 minutes) was studied by separate series.

We established the dependence of the dynamics of growth of microorganisms on exposure. Irradiation lasting 5-15 minutes stimulated or did not affect the intensity of growth of the strains under study. A 20-minute exposure caused a pronounced bactericidal effect. The number of bacterial colonies P. aeruginosa, which remained viable, lowered statistically significantly by 61-68% compared to control. The specified pattern equally concerned both blue and red polarized monochromatic non-coherent light.

MONITORING OF OXYGEN CONCENTRATION CHANGES BY DIODE LASER LIGHT DIFFUSE REFLECTANCE

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Introduction. The mechanism of photodynamic therapy is based on three main components, which presence in the tumor is obligatory for the antitumor activity: photosensitizer, light and oxygen. Photosensitizer after laser irradiation can interact with molecular oxygen and transfer the absorbed energy to the molecule. That leads to singlet oxygen formation, which due to its strong oxidant activity damages cancer cells. Therefore, the effectiveness of photodynamic therapy treatment depends on molecular oxygen saturation level in the tissues during irradiation.

In the present work we studied the ability to record the changes in tumor oxygenation level as a result of photosensitizer in situ activation by the noninvasive method, based on the red light diffuse reflectance. This method is applied in the range, where the difference between absorption spectra of oxygenated and deoxygenated haemoglobin is rather high in a result of the strong absorbtion and

scattering of the red light in the tissue when the concentration of the molecular oxygen is low.

Materials. Photolon (10 mg/kg) or physiological saline was intravenously injected into C57Bl/6 female mice bearing Lewis lung carcinoma. After 1h of accumulation period, all tumors were irradiated with semiconductor laser Lika-Khirurg M, wavelength of 660 nm (Fotonika Plus, Ukraine) using the following parameters: power density 250 mW/cm^2, light energy dose 225 J/cm^2. Irradiation regime was controlled by Nova II Laser Power Meter (Ophir Optronics, Israel).

For tissue oxygen saturation level detection we used laser diodes with wavelengths of 635 nm. The use of laser diodes was justified by the low power requirements of diagnostic radiation - from 1 to 0.8 mW. Radiation from diodes was focused on the distal of quartz optical fiber (400 microns in diameter) which guided light to the tumor. Light passed through the tissue, underwent reflection/scattering, and reached the receiving fiber, located on the tumor surface on a fixed distance from the illumination fiber. Receiving fiber was connected to USB 4000 CCD spectrometer (Ocean Optics, USA), which was guided by computer via USB-interface.

Diagnostic signal was recorded during the period of tumor irradiation by the 660 nm laser light with one minute overlapping before and after the light treatment to register baseline and changes of signal in a result of therapy respectively. Position of optic fibers with respect to the tumor was unchanged during signal recording session. The mice were anesthetized before irradiation.

Results. In a result of the laser irradiation of the mice from control group, that received only physiological saline, we obtained the tendency to the oxygen saturation increase comparing to the level, obtained before laser treatment. This effect may be explained by the ability of the red light to improve the blood circulation in vessels.

Contrary to the control group, oxygen level in the tumours of mice that received photosensitizer was significantly depleted after irradiation comparing to the initial level in the malignant tissue. This effect indicates that in the photosensitized tumor tissue during light irradiation the triplet oxygen consumption may exceed its resupply, which lead to the detectable decrease of its level in the tumor. These results coincide with the reports about photochemical oxygen depletion in a result of photodynamic therapy by other groups done by invasive methods of oxygen saturation level recording. The main advantage of the applied method is the ability of its harmless application during the photodynamic therapy of patients.

Conclusions. The technology of the noninvasive tissue oxygen saturation detection by laser diodes with fiber-optics probes demonstrated its applicability during the photodynamic therapy of tumors. This opens the way to the designing of the advanced laser equipment for individualized treatment of tumors using photodynamic therapy, that would be able to irradiate malignant tissue only in the presence of oxygen that in turn will increase the effectiveness of the therapy.