

Effect of methylene blue on oxygenation level in mice with Ehrlich solid tumors

Daria V. Pominova^{1,2}, Anastasia V. Ryabova^{1,2}, Elizaveta I. Kozlikina^{1,2}, Alexey S. Skobeltsin^{1,2}, Igor D. Romanishkin¹

¹ Prokhorov General Physics Institute of the Russian Academy of Sciences, Moscow, Russia

² National research nuclear university MEPhI, Moscow, Russia

One of the unresolved problems of PDT is the effect on tumors that are in a state of hypoxia, for example, many tumors of the prostate and pancreas.

A promising photosensitizer for research in this direction is methylene blue (MB). MB has both photodynamic activity (under laser irradiation) and redox and catalytic properties (in the absence of light). According to the literature, MB is able to increase the oxygen consumption of tumors. The catalytic properties of MB in relation to tumors are due to its interaction with lactic acid, which is formed as a result of aerobic glycolysis. A positive effect of MB on peripheral blood flow has also been reported. At the same time, MB exhibits fluorescence in the red part of the spectrum and significant photodynamic activity.

In this work, the effect of intravenous and oral administration of MB on the oxygenation level and blood flow rate on mice with Ehrlich solid tumors was analyzed using spectroscopic and video-fluorescence methods. It has been shown that MB therapy increases tissue oxygenation level and restores normal blood flow, which contributes to more successful anticancer therapy.

The study was funded by a grant from the Russian Science Foundation (project N 22-72-10117).