APPLICATION OF EPR SPECTROSCOPY TO EXAMINATION OF PDT PROCESSES

B. PILAWA[1], M. LATOCHA[1], R. PIETRZAK[2], H. WACHOWSKA[2]

[1]Medical University of Silesia, Sosnowiec, Poland;
[2]Adam Mickiewicz University, Poznań , Poland

Electron paramagnetic resonance (EPR) spectroscopy is a useful technique for examination of free radical processes and oxygen effects during photodynamic therapy (PDT) of tumor cells. In this lecture applications of EPR method to determination of the best PDT conditions are presented. Free radicals are formed directly by laser irradiation of cells, and during interactions of excited photosensitizer with cells. Imparting energy from photosensitizer to cell structures causes free radical formation. Interactions of photosensitizer with oxygen molecules O_2 lead to excitation of oxygen molecules O_2 from the ground triplet state with spin S = 1 to the singlet state with spin S = 0. Singlet oxygen forms free radicals in laser irradiated cells. The review of our works done in cooperation with the Department of Biophysics and Department of Cell biology is presented. The results refer to continuous wave EPR measurements at X-band (9.3 GHz) with magnetic modulation of 100 kHz. To obtain EPR spectra of free radicals in pathological cells, Rapid Scan Unit of Jagmar (Kraków) was used. Free radicals and singlet oxygen formation in melanotic and amelanotic tumor cells, fibroblasts and nasal polypes are presented. Interactions of *o*-semiquinone free radicals of melanin biopolymers and free radicals rising during laser irradiation are discussed. New paramagnetic oximetric probes are presented. Paramagnetic coal probes obtained from the Institute of Chemistry, AMU in Poznań are characterized. Application of TEMPO in the oximetry of irradiated cells is proposed. Parameters of EPR spectra of the probes located in different cell cultures upon PDT are compared.