APPLICATION OF FLUORESCENT DYES $DiOC_6$, TMA-DPH AND DPH IN STUDIES OF METALPORPHYRIN-LIPID BILAYER INTERACTIONS

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Porphyrins, particularly their complexes with metals, are abundant in nature and therefore were investigated in many laboratories. These compounds were extensively studied since many years also because of their potential usage as photosensitizers in photodynamic therapy (PDT). For the same reason many new porphyrins were synthesized to obtain compounds of improved properties like solubility in water etc. Application of porphyrins in PDT invited also some laboratories to study the interactions of photosensitizers with biological membranes.

In this poster we present the results of investigations of the interactions of three electrically charged and water soluble metaloporphyrins (PFe, PCo, PMn) with lipid bilayers. The chemical structure of studied porphyrins was almost identical, all of them possessed four positive electrical charges and they differed exclusively in the type of metal atom (Fe, Co, Mn) present in the center of porphyrin ring. Interactions were assessed spectrofluorometrically by measuring the influence of porphyrins on the fluorescence of dyes: $DiOC_6$, TMA-DPH and DPH incorporated into liposomes formed of neutral and electrically charged lipids.

In negatively charged liposomes (formed using DMPG) labeled with $DiOC_6$ we found that porphyrins are quenching fluorescence of this dye in a concentration-dependent manner. Simultaneously the shape of $DiOC_6$ spectra remained unchanged. The strongest quenching was observed for PFe, slightly weaker for PMn while PCo caused a rather weak quenching effect. In the same order these porphyrins reduced the mobility of $DiOC_6$ molecules, what was observed by fluorescence polarization anisotropy measurements. For DPH and TMA-DPH we found that the presence of porphyrins influences the fluorescence intensity but they also alter the shapes of fluorescence spectra of these dyes. The impact of porphyrins on TMA-DPH spectra was bigger than on DPH, spectra alteration effect was also dependent on the charge of liposome membrane. The most profound spectrum changes were observed in DMPG liposomes, weaker effects occurred in EYPC/PI liposomes while in EYPC liposomes only slight spectra alterations were recorded.

We conclude that porhyrins affect not only the properties of polar head-group region of lipid bilayers (what can be expected on the basis of chemical structures of porphyrins and lipids) but, surprisingly, they also perturb the hydrophobic core of membranes.