Porphyrazine in Cell: Light-Triggered Killer Plus Viscosity Measurer

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Fluorescent molecular rotors (molecules that can emit light when they absorb energy and whose parts can turn one around another) can be used for observing the process of the light-caused destruction of a tumor cells by measuring intracellular medium viscosity. I assumed that tetra(4-fluorophenyl) tetracyano porphyrazine (a derivative of an affordable organic dye) has such a behavior. To learn whether this compound is a molecular rotor, I did the set of experiments with model glycerin solvent of a various viscosity with ethanol, water, and normal saline. Fluorescence quantum efficiency was measured for each of them. I found out that increasing of solvent viscosity leads to the increasing of quantum efficiency, probably because the rotation of fluorophenil arrangements is blocked. The next stage was analyzing the interaction between porphyrazine and blood serum proteins. I measured the fluorescence quantum efficiency of porphyrazine in the solvent with various percentage of Fetal Bovine Serum in phosphate-buffer saline to determine the way how interacts porphyrazine with proteins. I found out that increasing of serum percentage leads to the dramatical increasing of the porphyrazine fluorescence quantum efficiency. The experiment of the third phase of research is dedicated to measuring the excited-state lifetime of the porphyrazine in process of photodynamic therapy (PDT) targeted on the cell culture of human mammary adenocarcinoma. The difference between the excited-state lifetimes of illuminated and non illuminated cells was observed approximately from 250 ps to 720 ps even up to 90 minutes after exposure to light. This results show the possibility of using the porphyrazine as a PDT agent which allows monitoring the process just in time of photodynamical exposure.

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