UPTAKE OF VISCOSITY SENSITIVE BODIPY-H MOLECULAR ROTOR IN BREAST CANCER CELLS

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Viscosity is cell‘s fundamental mechanical property, which plays a major role in determining mobility and diffusion rates of different molecules. Abnormal viscosity changes might trigger cellular malfunctions causing cancer, atherosclerosis, diabetes and Alzheimer‘s disease [1]. Greater understanding and imaging of viscosity changes within cells during the course of these diseases is required to achieve earlier diagnosis and increased survival rate.

BODIPY (boron-dipyrromethene) is a fluorescent dye and its peripheral substitutions of the core are used to create unique modified forms such as BODIPY-h. These forms are termed 'molecular rotors' and can be utilized for the detection of changes in viscosity [2]. During the process of normal cells becoming cancer cells a wide range of mutations occur, including abnormal viscosity changes within cell. Therefore, breast cancer cells are used in the experiment with BODIPY-h, which has the potential to detect the following changes.

The aim of our study was to find absorption and fluorescence spectra of newly synthesized dye in different solutions as well as accumulation and distribution of BODIPY-h using living breast cancer cells.

Absorption and fluorescence spectra of BODIPY-h were measured in different solutions: phosphate-buffered saline (PBS), distilled water and cell growth media - Dulbecco's Modified Eagle Medium (DMEM). For uptake evaluation breast cancer cell lines MDA-MB-231 and MCF-7 were used. Cells were seeded in 8-well microscopy plates at density of $3 \cdot 10^4$ cells/well and cultivated in 37 °C incubator. After 24 h of cultivation, the old medium in each well was replaced with 9 nM BODIPY-h solution diluted with DMEM (1:1000) (Gibco, US) and incubated for 60 min, 30 min, 15 min respectively. After incubation with the dye, the nuclei of the cell were stained with Hoechst 33258 (Sigma, Germany). The accumulation of BODIPY-h was observed using Nikon Eclipse Te2000-U0, confocal microscope (Nikon, Japan).

Results revealed that the BODIPY-h absorption and fluorescence spectra depend on solvent, as well as that BODIPY-h is a cell membrane permeable fluorescent dye. Further research is compulsory before viable application of BODIPY-h as a viscosity indicator within cells.

[1] M. K. Kuimova, “Mapping viscosity in cells using molecular rotors,” *Phys. Chem. Chem. Phys.*, vol. 14, no. 37, p. 12671, 2012.
[2] A. Vyšniauskas *et al.*, “Exploring viscosity, polarity and temperature sensitivity of BODIPY-based molecular rotors,” *Phys. Chem. Chem. Phys.*, vol. 19, no. 37, pp. 25252–25259, 2017.